OFFICE, CHIEF OF ENGINEERS

CONTRACT NO.

ENGINEERING STUDY
RESISTANT DESIG
BUILDING

PREP

AMMANN

CONSULTIN

NEW

APPENDIX H

S, DEPARTMENT OF THE ARMY

DA 49-129-ENG-317

Y OF ATOMIC BLAST GN FOR SEVERAL G TYPES

PARED BY

& WHITNEY

NG ENGINEERS

YORK, N.Y.

AY 1960

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OFFICE, CHIEF OF ENGINEERS, D

CONTRACT NO. DA 4

ENGINEERING STUDY
RESISTANT DESIGN
BUILDING

PREPARED

AMMANN & W

CONSULTING EN

NEW YORK,

DRAWING L

DWG NO 60-16-01 PROTECTIVE CONSTRUCTION - ADMINISTRATION BUILDING

SHEETS	1	THRU	9	OF	9	10 PSI BLAST RESISTANT
SHEETS	1	THRU	9	OF	9	20 PSI BLAST RESISTANT
SHEETS	1	THRU	3	OF	3	50 PSI BLAST RESISTANT

DWG NO 60-02-06 PROTECTIVE CONSTRUCTION - COMMUNICATIONS BUILDING

SHEETS	1	THRU	3	OF	3	10 PSI BLAST RESISTANT
SHEETS	1	THRU	3	OF	3	20 PSI BLAST RESISTANT
SHEETS	1	THRU	2	OF	2	50 PSI BLAST RESISTANT

DWG NO 60-17-01 PROTECTIVE CONSTRUCTION - WAREHOUSE

SHEETS	1	THRU	3	OF	3	10 PSI BLAST RESISTANT
SHEET	1			OF	1	20 PSI BLAST RESISTANT
SHEET	1			OF	1	50 PSI BLAST RESISTANT

DWG NO 60-17-02 PROTECTIVE CONSTRUCTION - EARTH COVERED, CONCRETE IGLOO

SHEET	1			OF	1	25 PSI BLAST RESISTANT
SHEET	1			OF	1	50 PSI BLAST RESISTANT
SHEET	1			OF	1	100 PSI BLAST RESISTANT
SHEET	1			OF	1	200 PSI BLAST RESISTANT

DWG NO 60-18-01 PROTECTIVE CONSTRUCTION - EARTH COVERED, RECTANGULAR

SHEETS	1	THRU	2	OF	2	25 PSI BLAST RESISTANT
SHEETS	1	THRU	2	OF	2	50 PSI BLAST RESISTANT
SHEET	1			OF	1	100 PSI BLAST RESISTANT
SHEET	1			OF	1	200 PSI BLAST RESISTANT

DWG NO 60-18-02 PROTECTIVE CONSTRUCTION - EARTH COVERED, DOUBLE BARREL ARCH

SHEET	1			OF	1	50 PSI BLAST RESISTANT

DWG NO 60-18-03 PROTECTIVE CONSTRUCTION - EARTH COVERED, DOME

SHEET	1			OF	1	50 PSI BLAST RESISTANT
SHEET	1			OF	1	100 PSI BLAST RESISTANT
SHEET	1			OF	1	200 PSI BLAST RESISTANT

RS, DEPARTMENT OF THE ARMY

D. DA 49-129-ENG-317

DY OF ATOMIC BLAST IGN FOR SEVERAL NG TYPES

PREPARED BY

N & WHITNEY

LTING ENGINEERS

EW YORK, N.Y.

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RAWING LIST

DWG NO 60-18-04 PROTECTIVE CONSTRUCTION - BURIED, RECTANGULAR
SHEETS 1 THRU 2 OF 2 50 PSI BLAST RESISTANT
SHEET 1 OF 1 100 PSI BLAST RESISTANT
SHEET 1 OF 1 200 PSI BLAST RESISTANT

DWG NO 60-18-05 PROTECTIVE CONSTRUCTION - BURIED, DOUBLE BARREL ARCH
SHEETS 1 THRU 2 OF 2 50 PSI BLAST RESISTANT

DWG NO 60-18-06 PROTECTIVE CONSTRUCTION - BURIED, DOME
SHEETS 1 THRU 2 OF 2 50 PSI BLAST RESISTANT
SHEET 1 OF 1 100 PSI BLAST RESISTANT
SHEET 1 OF 1 200 PSI BLAST RESISTANT

DWG NO 60-18-07 PROTECTIVE CONSTRUCTION - BURIED, CONCRETE IGLOO
SHEETS 1 THRU 2 OF 2 50 PSI BLAST RESISTANT
SHEETS 1 THRU 2 OF 2 100 PSI BLAST RESISTANT
SHEETS 1 THRU 2 OF 2 200 PSI BLAST RESISTANT

CH

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OFFICE OF THE CHIEF OF ENGINEERS
MILITARY CONSTRUCTION ENGINEERING DIVISION
WASHINGTON D.C.

DRAWN BY P.J.W.

TITLE SHEET

DRAWING NUMBER

SHEET OF

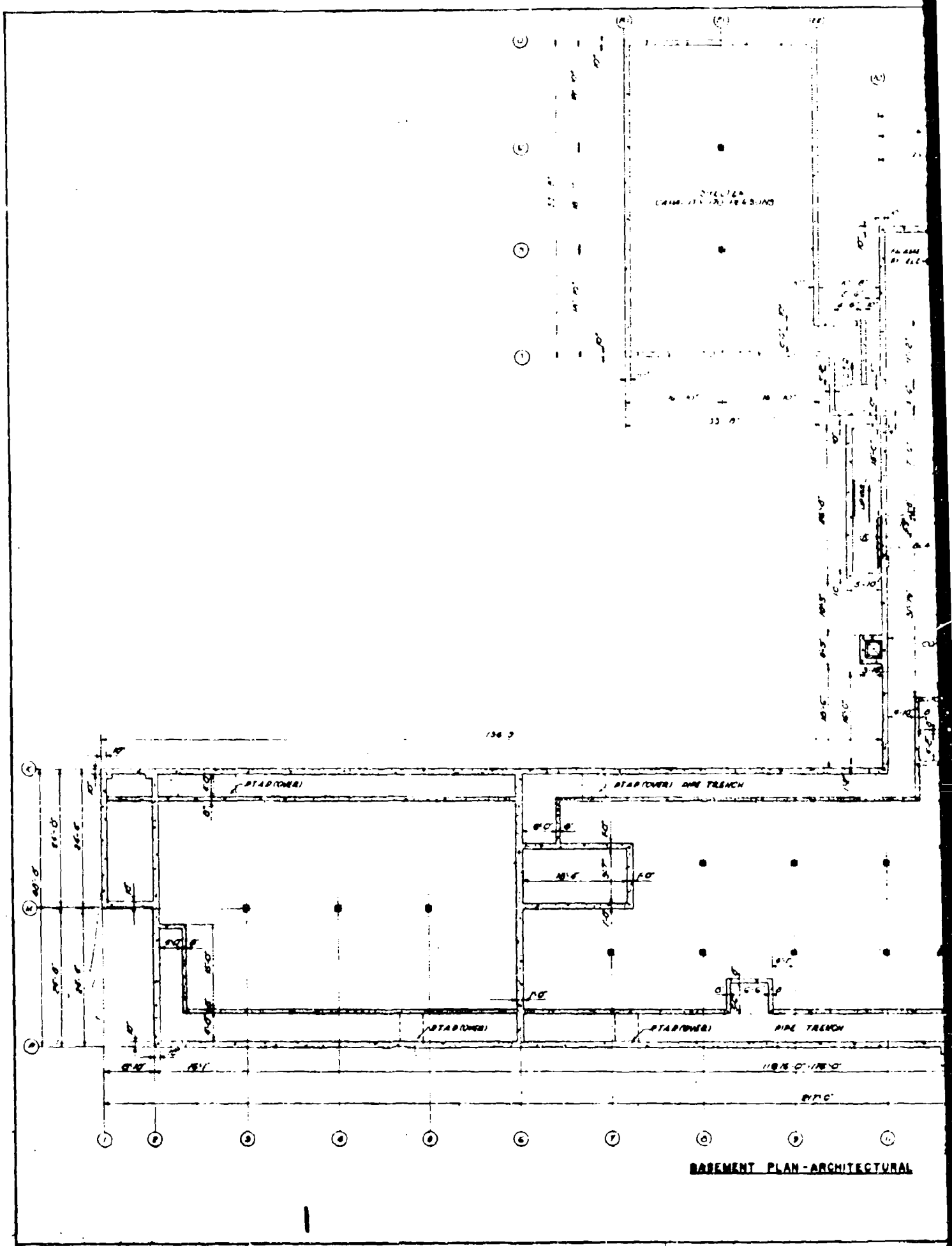
GE

THE FOLLOWING DRAWINGS ARE PART OF A REPORT ,"ENGI
DIFFERENT BUILDING TYPES", FEBRUARY 1959, SUMMARIZIN
OF DESIGN FOR ATOMIC BLAST RESISTANCE AND THE ES
LOADINGS. THE ADMINISTRATION, COMMUNICATIONS AND
EXISTING STANDARD TYPE STRUCTURES WITHOUT CHANG
THE NON STANDARD TYPE STRUCTURES, i.e., IGLOO, RE
PRESCRIBED BY OCE. THE DESIGN PROCEDURES, UNLESS
DRAFT OF THE CORPS OF ENGINEERS MANUALS EM 1110 -
EFFECTS OF ATOMIC WEAPONS". THESE DRAWING ARE IN
ARE NOT STANDARD DRAWINGS AND ARE NOT INTENDED
FOR PLANNING PURPOSES AND AS THE BASIS FOR DEV
GROUND STRUCTURES THE THICKNESS OF THE WALLS AN
AND THEREFORE IN SOME CASES WILL NOT PROVIDE A
COVERED AND BURIED STRUCTURES AND THE SHELTER
DESIGNED TO PROTECT AGAINST THE INITIAL NUCLEAR
ADEQUATE SHIELDING FROM FALLOUT RADIATION. THE
ADMINISTRATION, COMMUNICATION AND WAREHOUSE BUILDIN
WILL REQUIRE ADDITIONAL ANALYSES WHICH WERE N

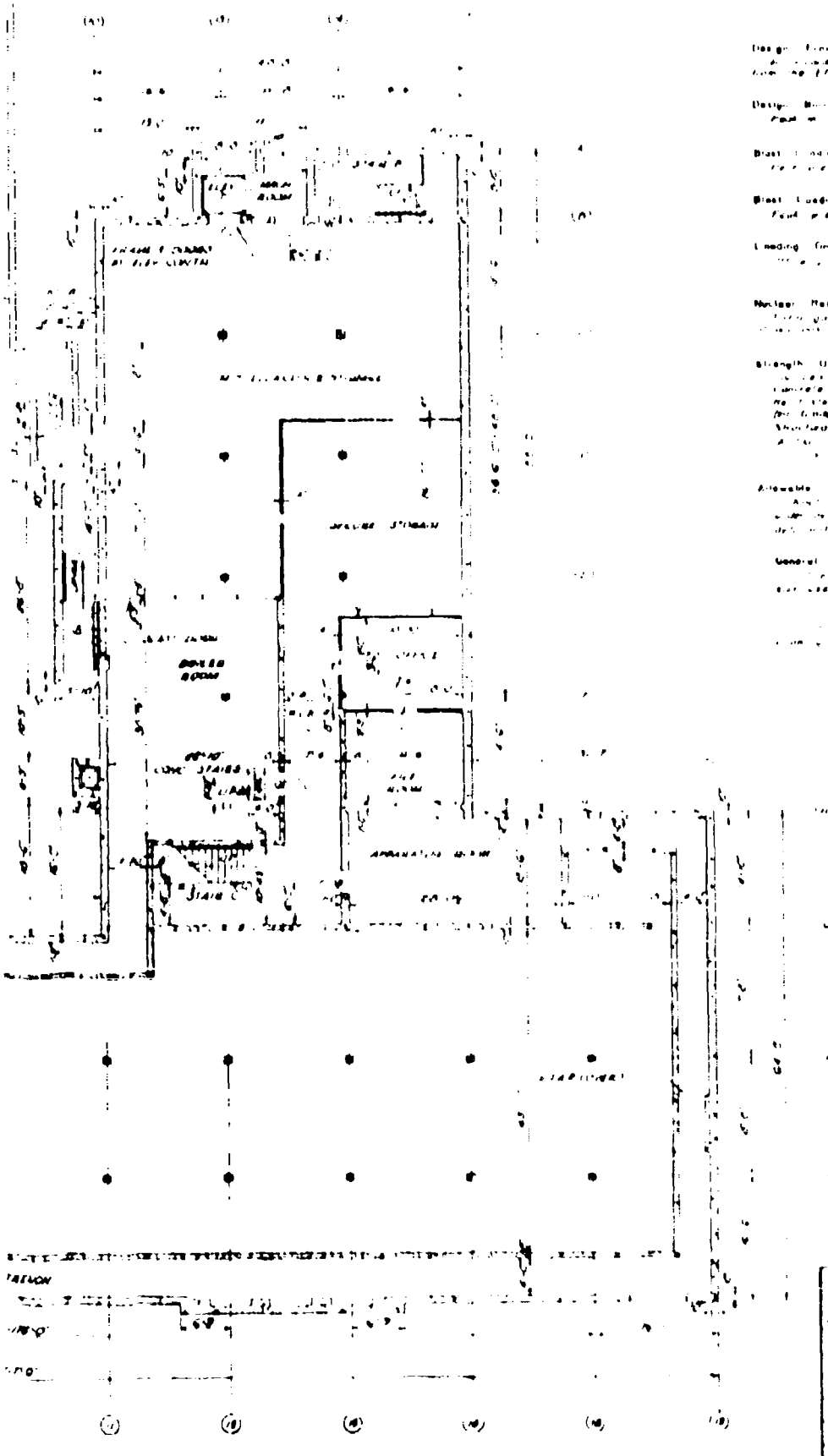
ENERAL NOTES

SINEERING STUDY OF ATOMIC BLAST RESISTANT DESIGN FOR SEVERAL
NG THE RESULTS OF A STUDY TO DETERMINE THE PRACTICABILITY
STIMATED CONSTRUCTION COST FOR A RANGE OF BLAST PRESSURE
WAREHOUSE DRAWINGS ARE BASED UPON THE HARDENING OF
GING THE INTERIOR CONFIGURATIONS. THE INTERIOR CONFIGURATIONS OF
ECTANGULAR, DOUBLE AND DOME, ARE BASED UPON DIMENSIONS
OTHERWISE NOTED IN THE REPORT WERE BASED UPON THE PRELIMINARY
345-413 THROUGH 421, "DESIGN OF STRUCTURES TO RESIST THE
NTENDED TO DEPICT THE RESULTS OF THE DESIGN STUDY ONLY THEY
TO REPRESENT RECOMMENDED DESIGN HOWEVER THEY CAN BE USED
VELOPMENT OF REQUIRED DESIGNS. IN THE DESIGN OF EXPOSED ABOVE
ND ROOF WERE DETERMINED BY BLAST RESISTANCE REQUIREMENTS
ADEQUATE SHIELDING FROM FALLOUT ISOLATION HOWEVER, THE EARTH
AREAS IN THE EXPOSED ABOVE GROUND STRUCTURES HAVE BEEN
AR RADIATION AS NOTED ON THE DRAWINGS AND THEREFORE AFFORD
PROVISION OF ADEQUATE THICKNESS IN THE WALLS AND ROOF OF THE
INGS TO PROVIDE THE REQUIRED SHIELDING FROM FALLOUT RADIATION
NOT INCLUDED IN THIS CONTRACT

2



BASEMENT PLAN-ARCHITECTURAL



DESIGN CONDITIONS

Design Criteria

Design Blast Loads

Blast Loading On Walls

Loading On Floors

Nuclear Radiation Protection For Shelter Area

Strength Of Materials — Shelter — Blast Design

Allowable Stresses And Deflections

General Notes

ARCHITECTURAL

2

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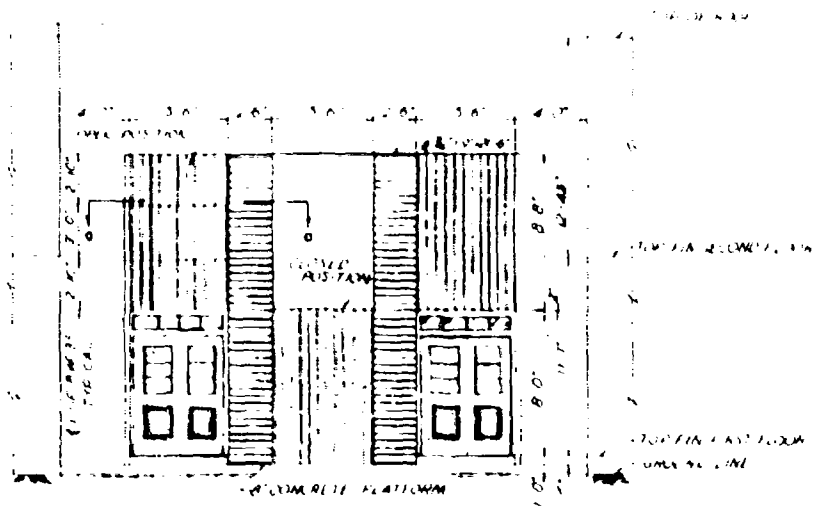
WASHINGTON D.C.

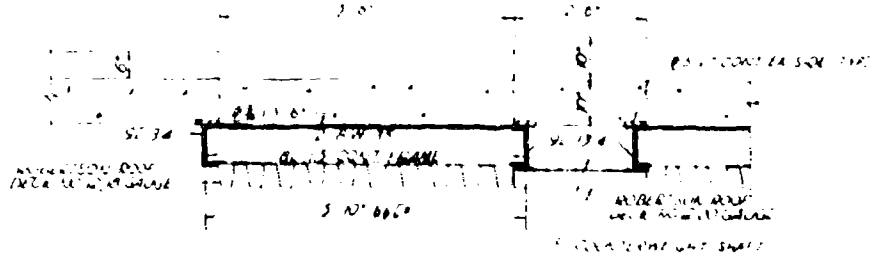
PROTECTIVE CONSTRUCTION
ADMINISTRATION BUILDING
10 PSI BLAST RESISTANT

DRAWING NUMBER
60 16 01
SHEET 1 OF 9



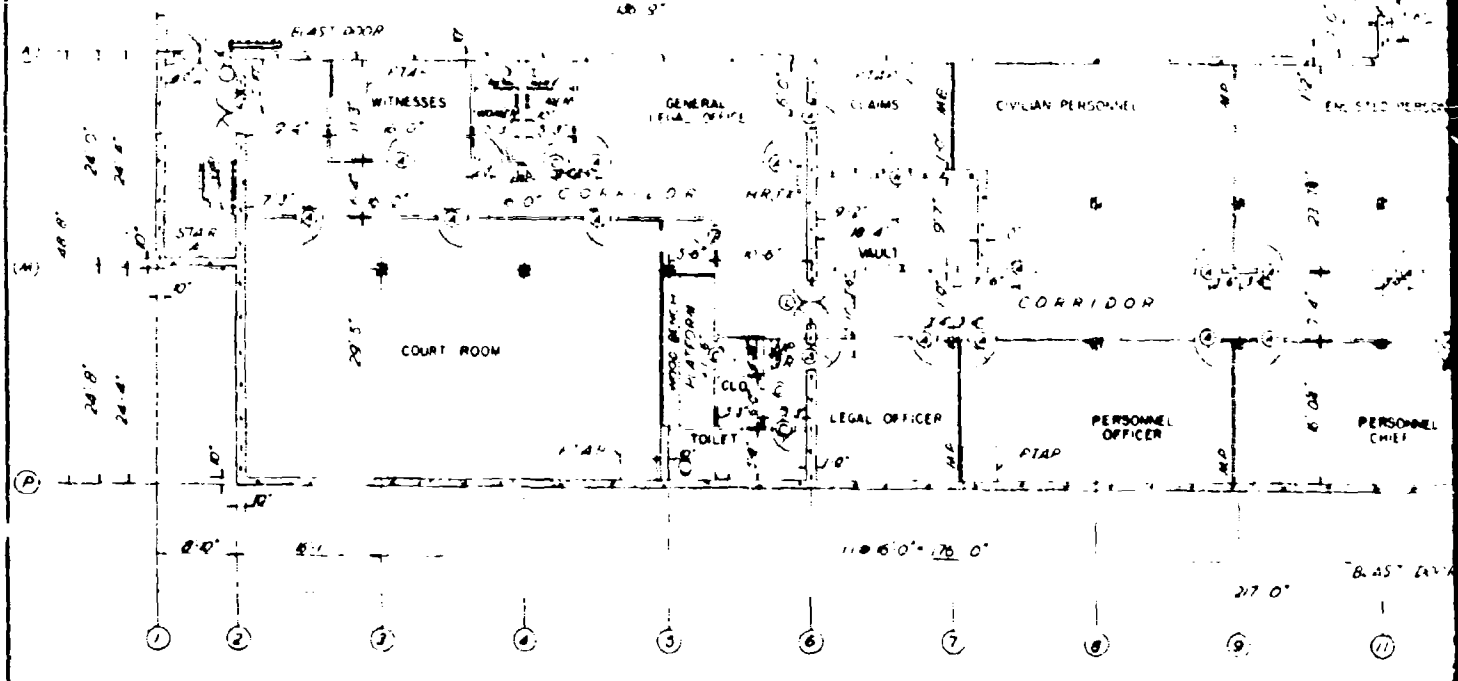
ELEVATION OF MAIN DOORS

SCALE 1/8" = 1'-0"



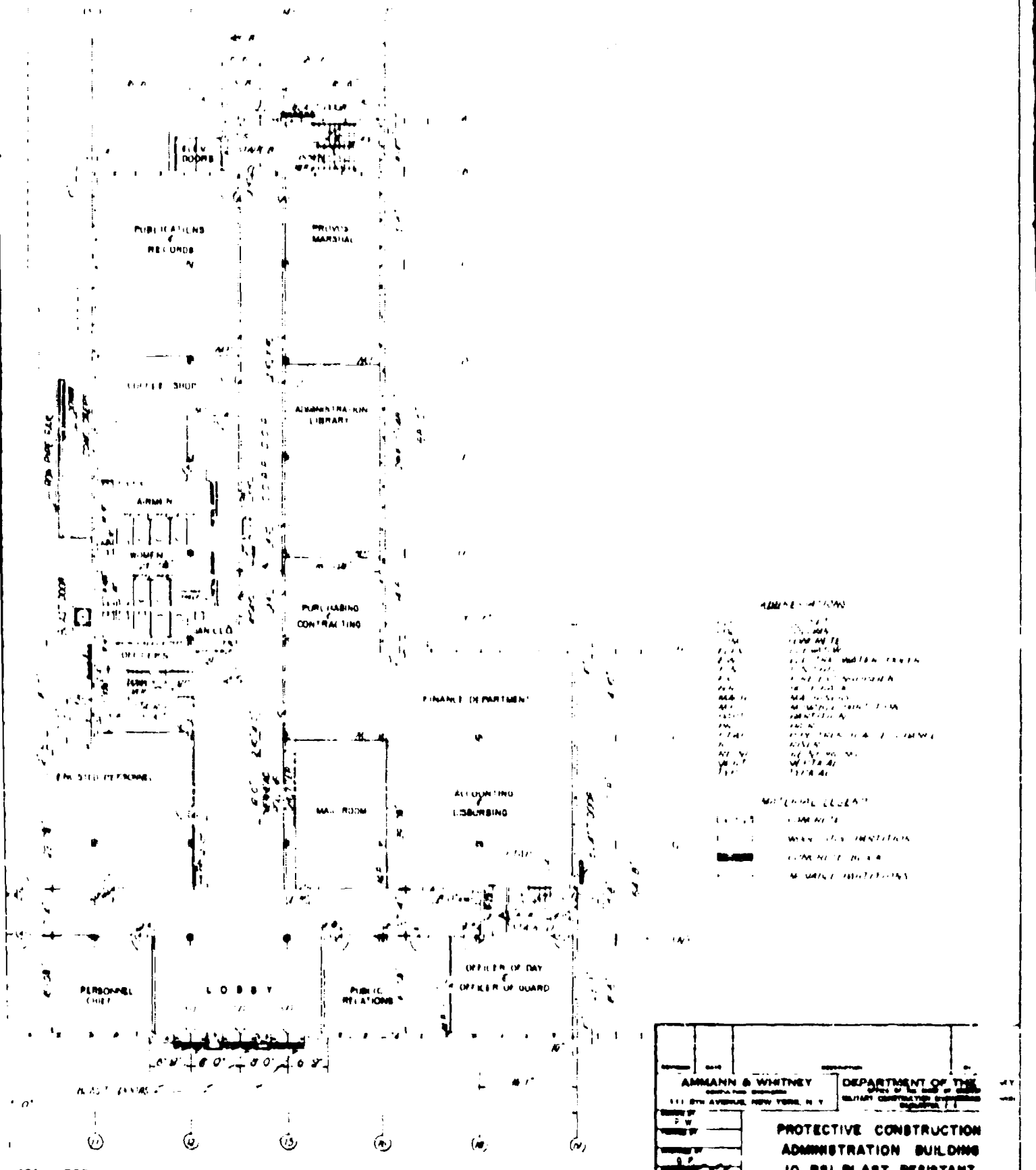
SECTION a-a

SCALE 1/8" = 1'-0"



FIRST FLOOR PLAN - ARCHITECTURAL

SCALE 1/8" = 1'-0"



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PROTECTIVE CONSTRUCTION
ADMINISTRATION BUILDING
10 PSI BLAST RESISTANT

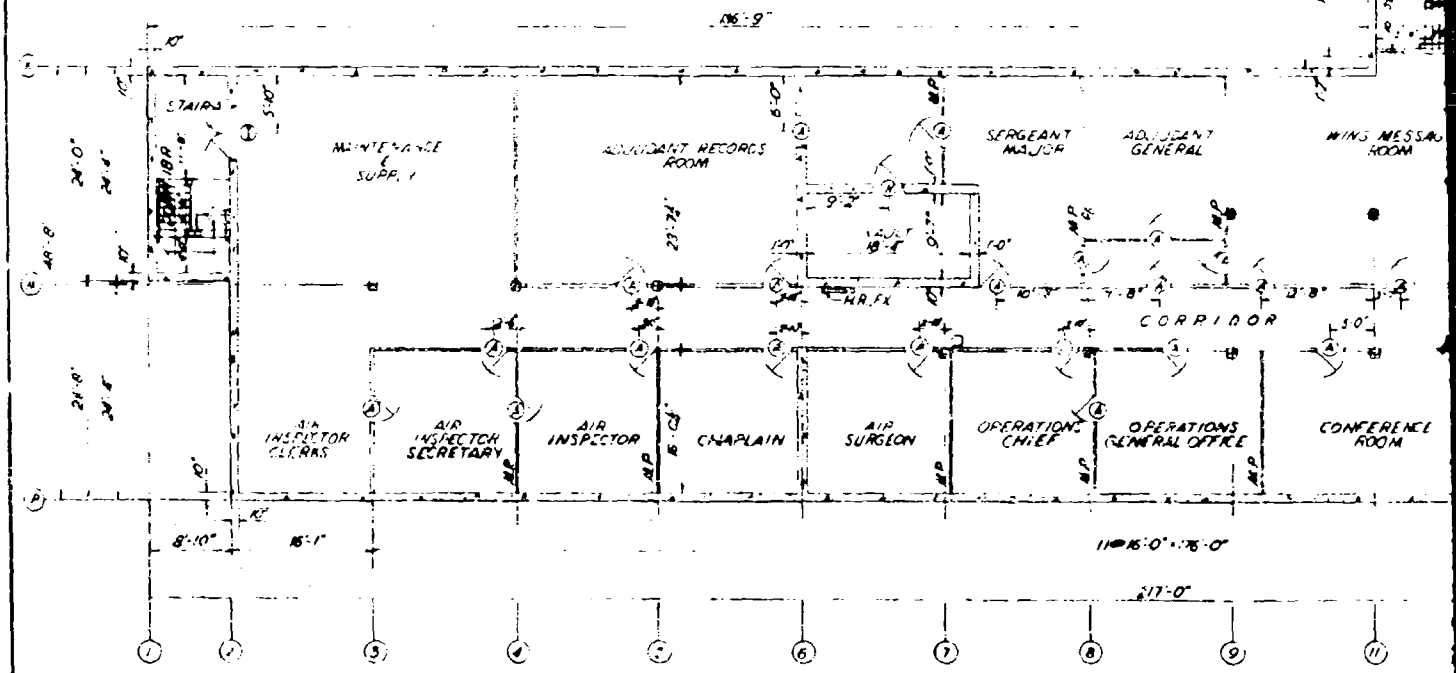
AS NOTED

DRAWING NUMBER
60-10-01

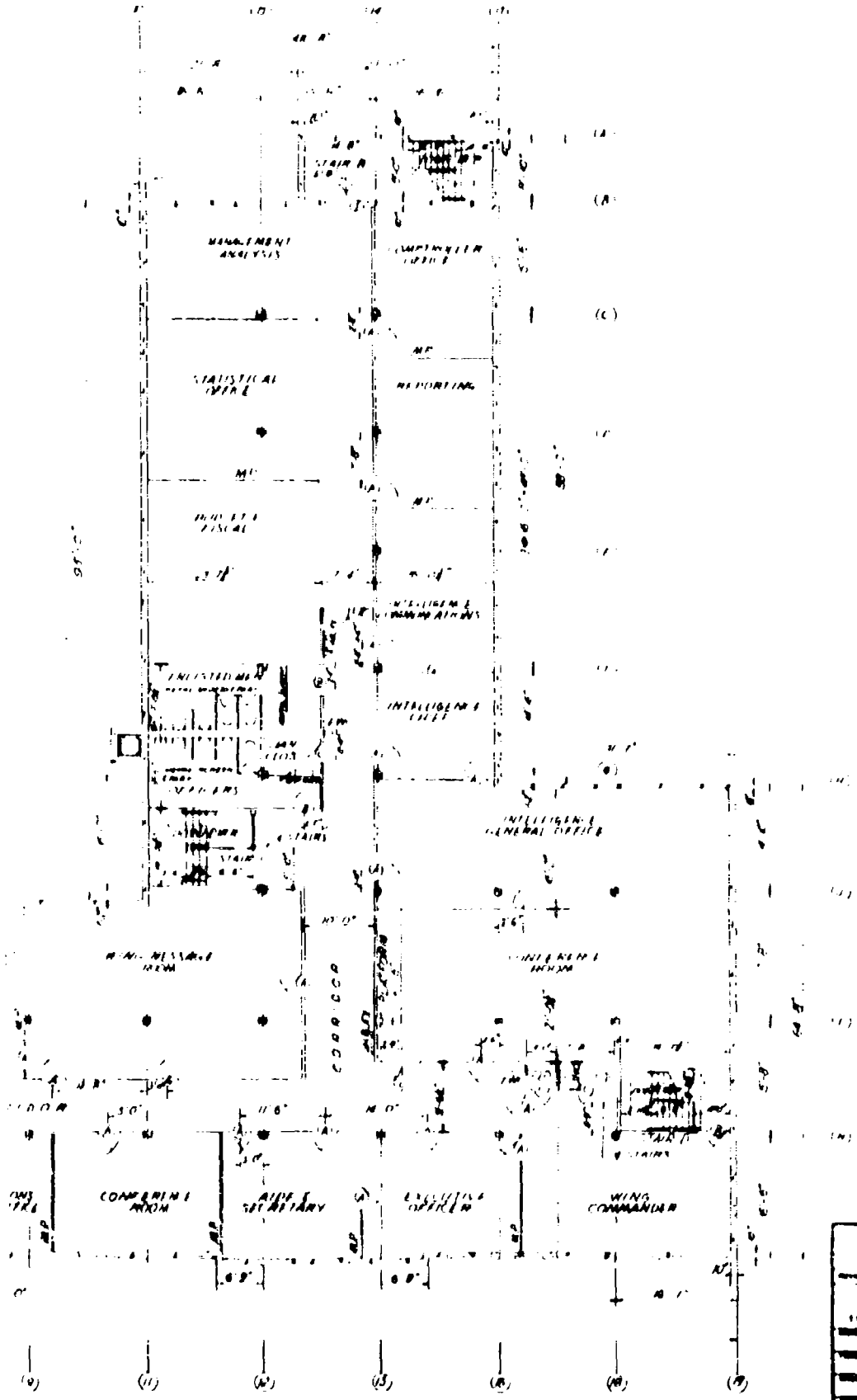
2

DOOR SCHEDULE

TYPE	MATERIAL	SIZE	GLASS
	INTERIOR		
A	WOOD	3'-0"×6'-8"×1⅜"	CLEAR
B	WOOD	2'-8"×6'-8"×1⅜"	
C	WOOD	2'-6"×6'-8"×1⅜"	
D	KALAMEIN	3'-6"×6'-8"×1⅜"	CLEAR WIRE
F	WOOD	2'-8"×6'-8"×1⅜"	CLEAR
G	WOOD	2'-6"×6'-8"×1⅜"	CLEAR
H	WOOD	3'-0"×6'-8"×1⅜"	CLEAR
J	KALAMEIN	5'-0"×6'-8"×1⅜" (PR)	CLEAR WIRE
K	KALAMEIN	3'-0"×6'-8"×1⅜"	
L	WOOD	5'-0"×6'-8"×1⅜" (PR)	CLEAR WIRE
M	TIN CLAD	3'-0"×6'-8"×1⅜"	
N	METAL	2'-8"×8'-6"	
O	KALAMEIN	3'-6"×6'-8"×1⅜"	
	EXTERIOR		
1	WOOD	5'-0"×6'-8"×2¼" (PR)	CLEAR
2	WOOD	2'-8"×5'-8"×2¼"	CLEAR
3	WOOD	6'-0"×7'-1"×2¼" (PR)	CLEAR WIRE
5	WOOD	5'-0"×7'-1"×2¼" (PR)	CLEAR



SECOND FLOOR PLAN - ARCHITECT



FLOOR PLAN-ARCHITECTURAL

2

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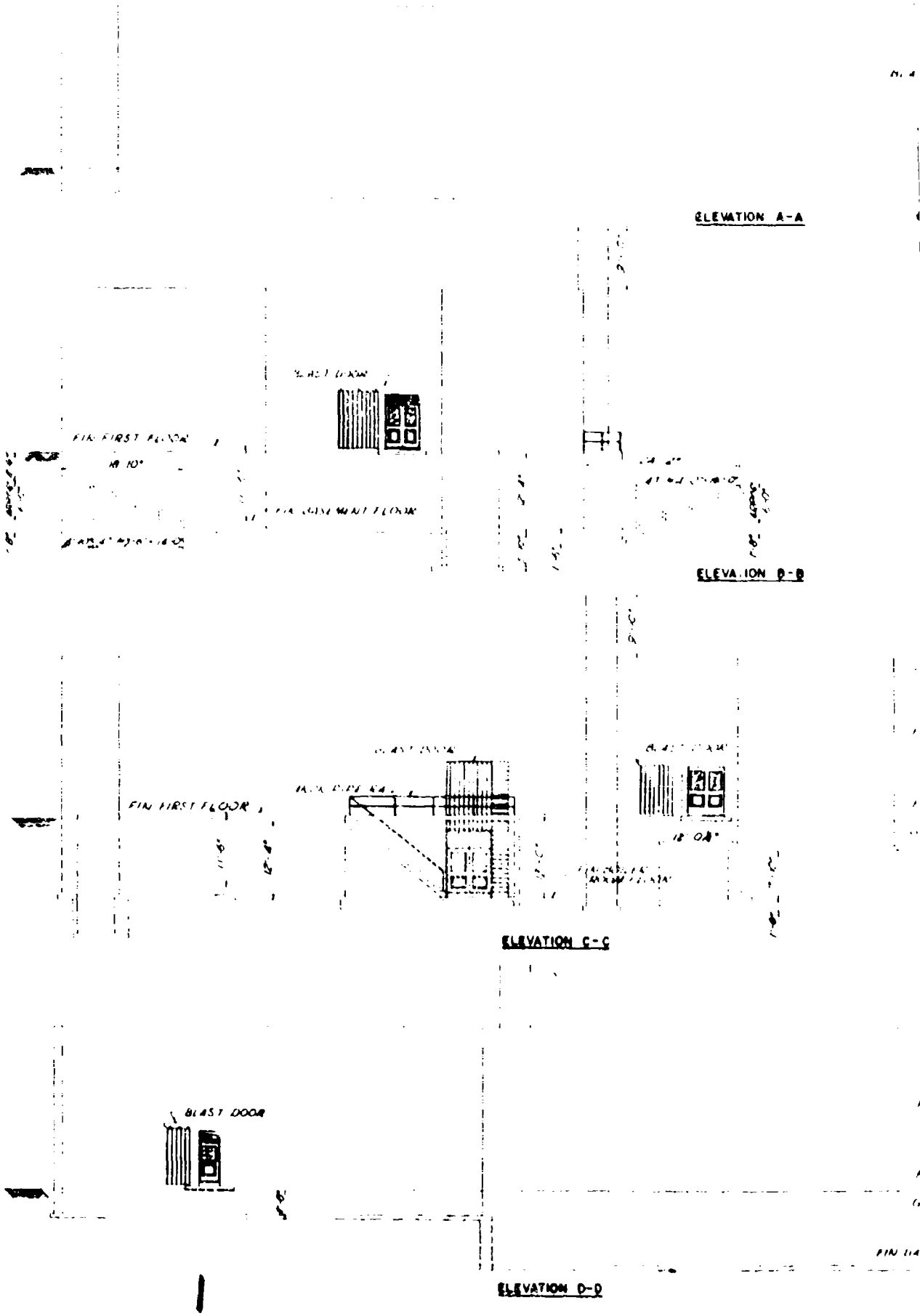
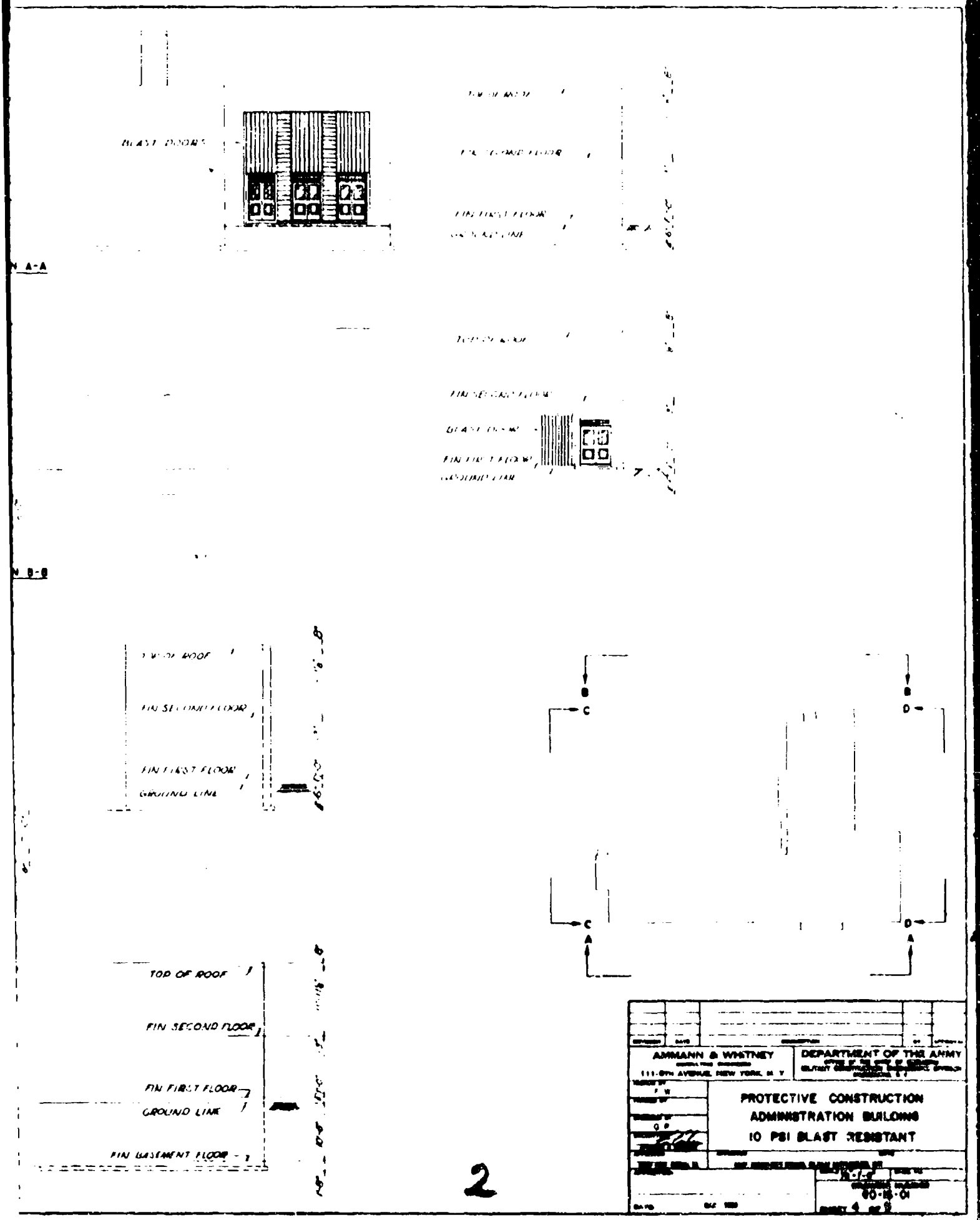
PROTECTIVE CONSTRUCTION
ADMINISTRATION BUILDING
10 PSI BLAST RESISTANT

DRAWING NUMBER
60-16-0
SHEET 3 OF 9


ELEVATION A-A
FIN FIRST FLOOR
ELEVATION B-B
FIN FIRST FLOOR
ELEVATION C-C
BLAST DOOR
ELEVATION D-D


BLAST DOORS
FIN FIRST FLOOR
A-A
FIN SECOND FLOOR
BLAST DOOR
FIN FIRST FLOOR
B-B
FIN SECOND FLOOR
FIN FIRST FLOOR
GROUND LINE
B
C
B
D
C
A
D
A
TOP OF ROOF
FIN SECOND FLOOR
FIN FIRST FLOOR
GROUND LINE
FIN BASEMENT FLOOR
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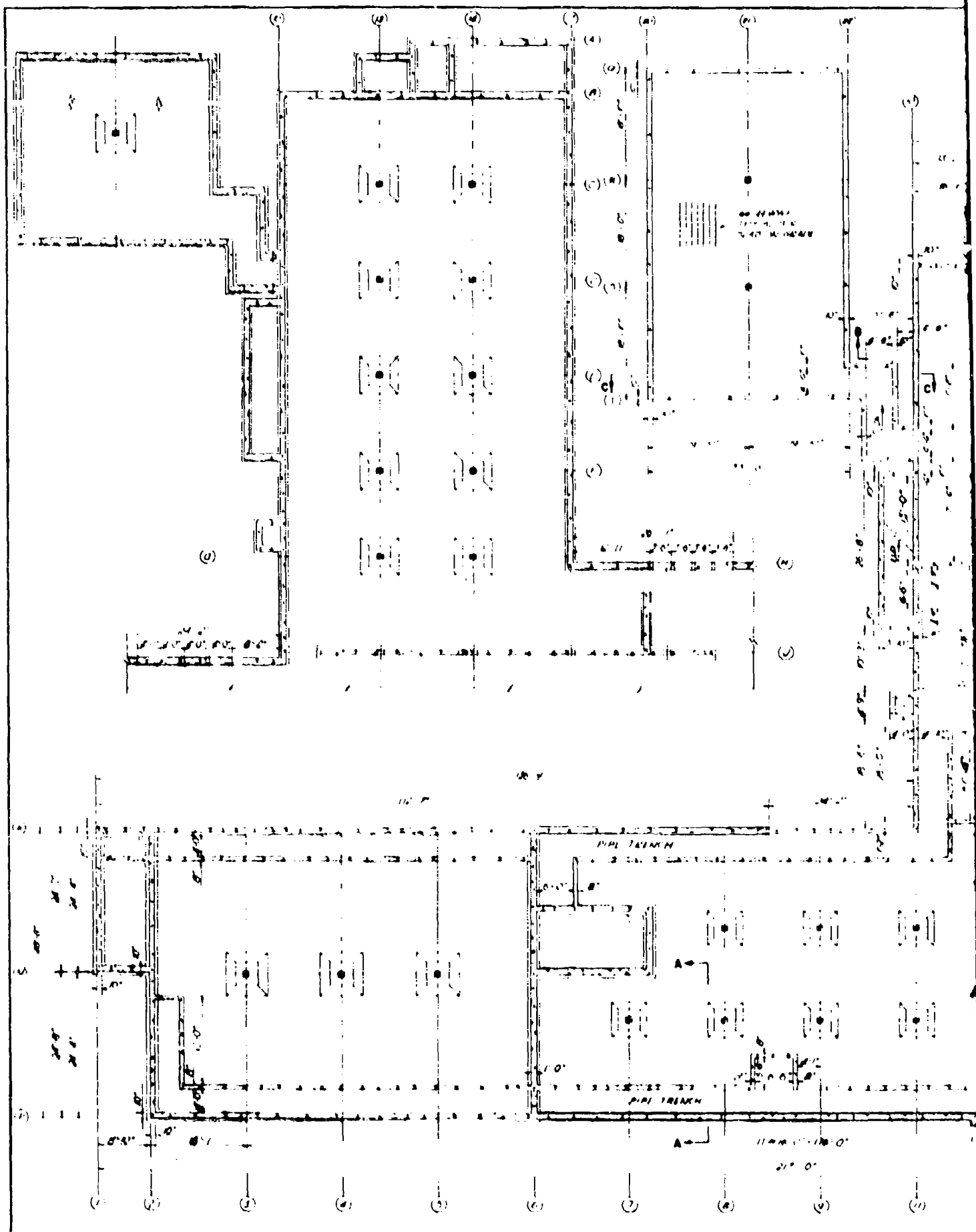
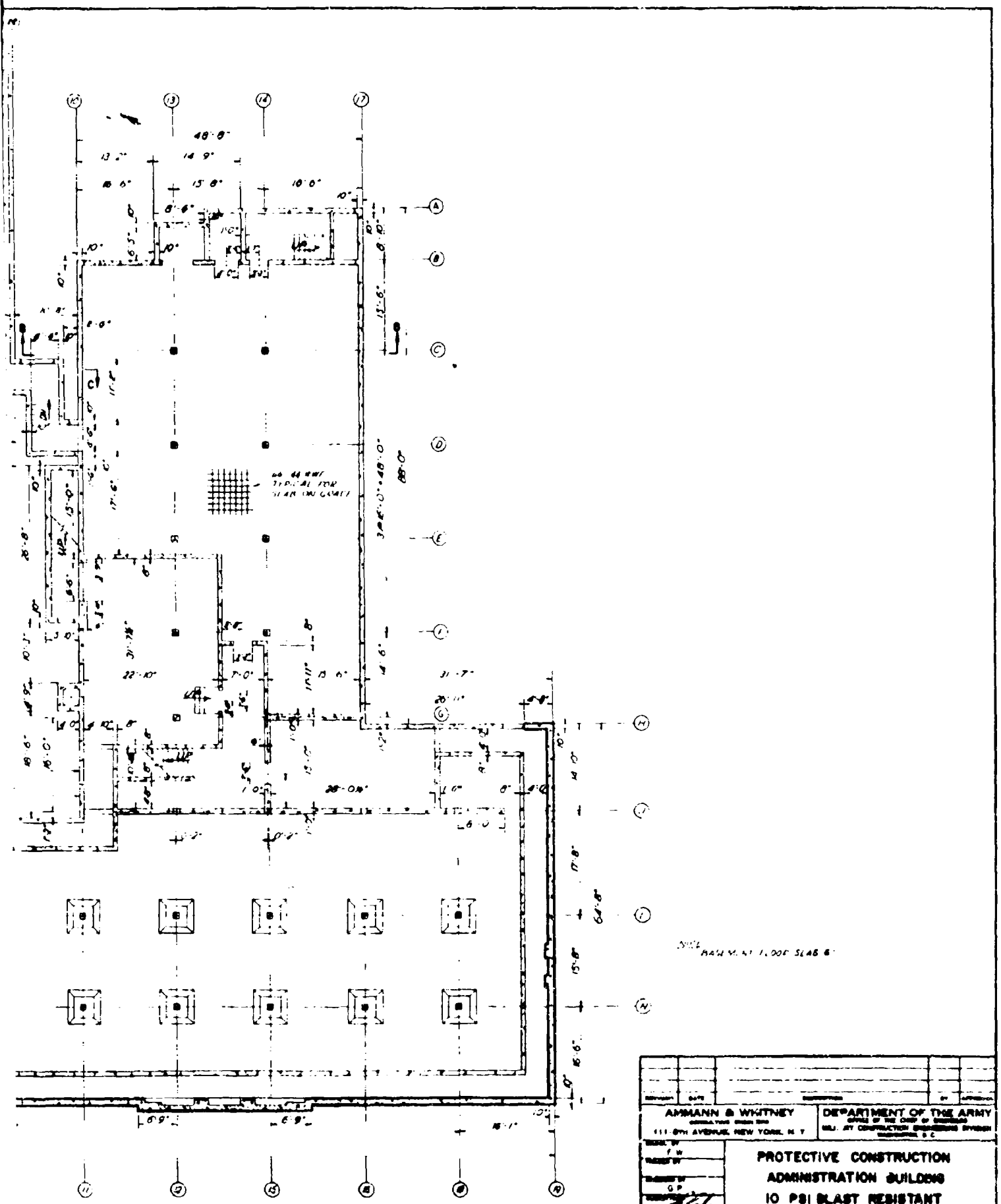
ADMINISTRATION BUILDING
10 PSI BLAST RESISTANT
60-16-01
2



BASEMENT AND FOUNDATION PLAN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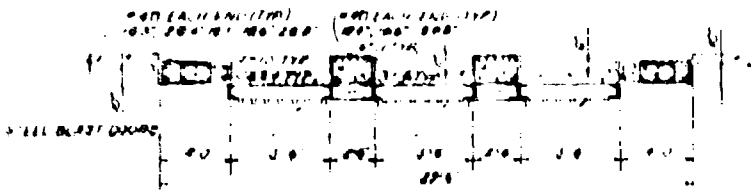
PROTECTIVE CONSTRUCTION
ADMINISTRATION BUILDING
10 PSI BLAST RESISTANT
60-48-01

TION PLAN

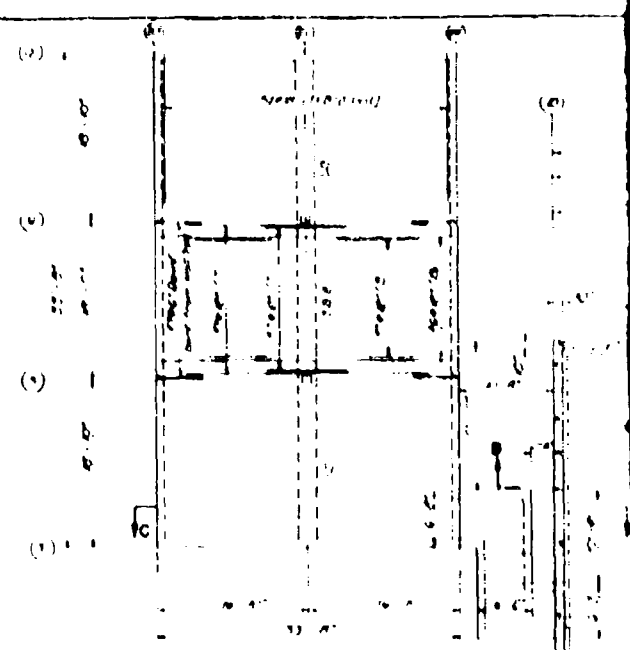
2

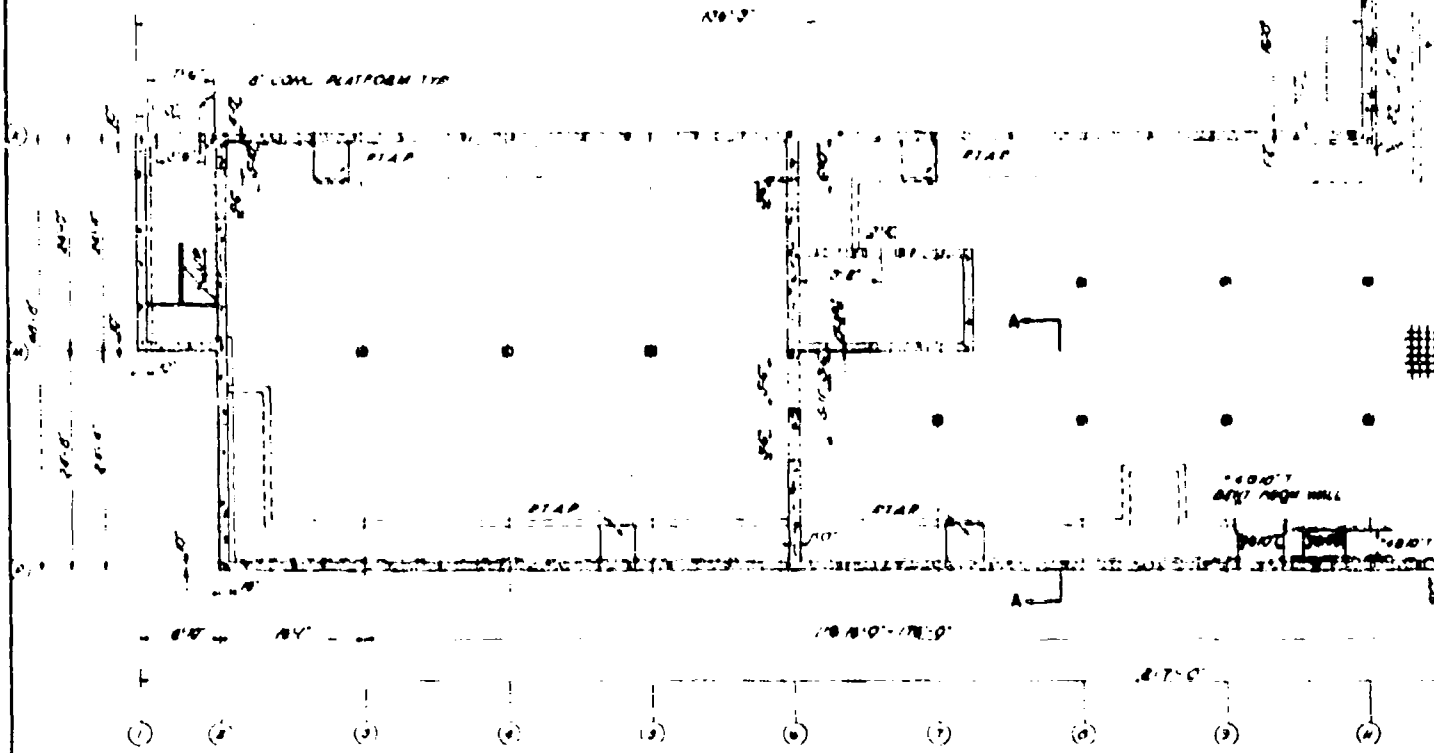


FRAMING DETAIL AT MAIN ENTRANCE

SCALE 1/4" = 1'-0"

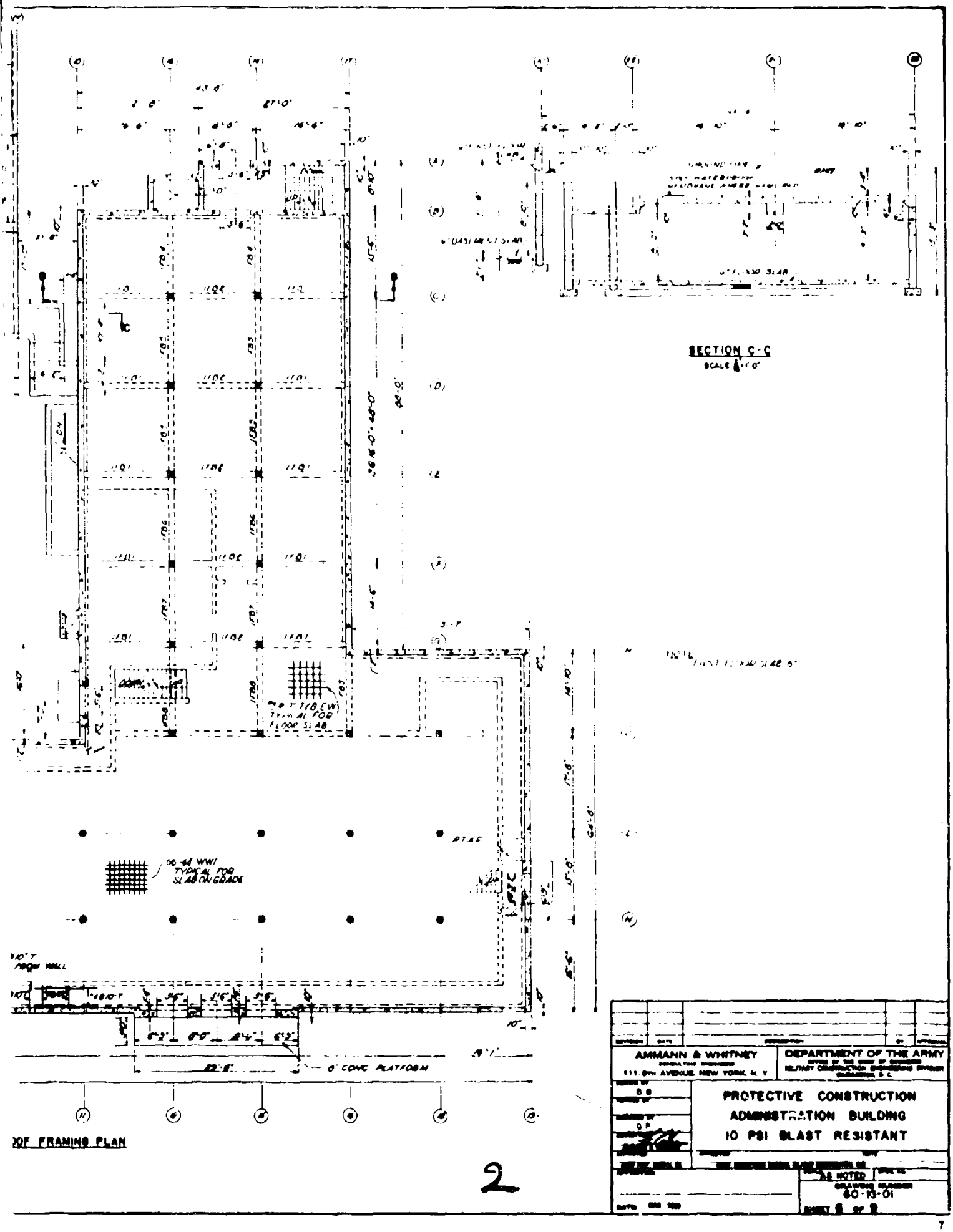
BEAM SCHEDULE





FIRST FLOOR AND SHELTER ROOF FRAMING PLAN

SCALE 1/4" = 1'-0"


SECTION C-C
SCALE 1/4"=1'-0"
TYPICAL FOR FLOOR SLAB
TYPICAL FOR SLAB ON GRADE
6" CONC PLATFORM
OF FRAMING PLAN
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ADMINISTRATION BUILDING
10 PSI BLAST RESISTANT
AS NOTED
60-13-01
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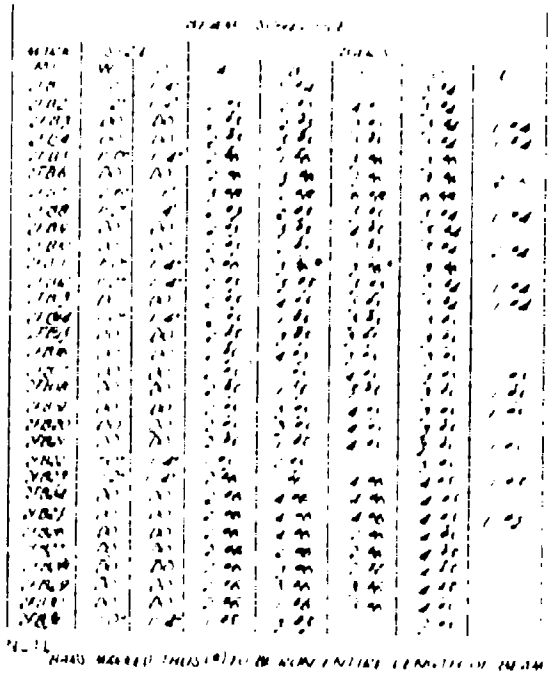
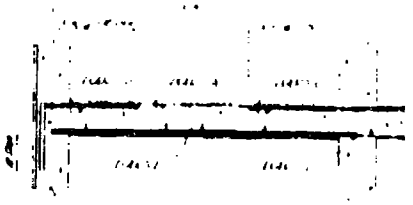
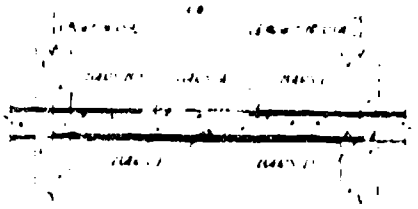
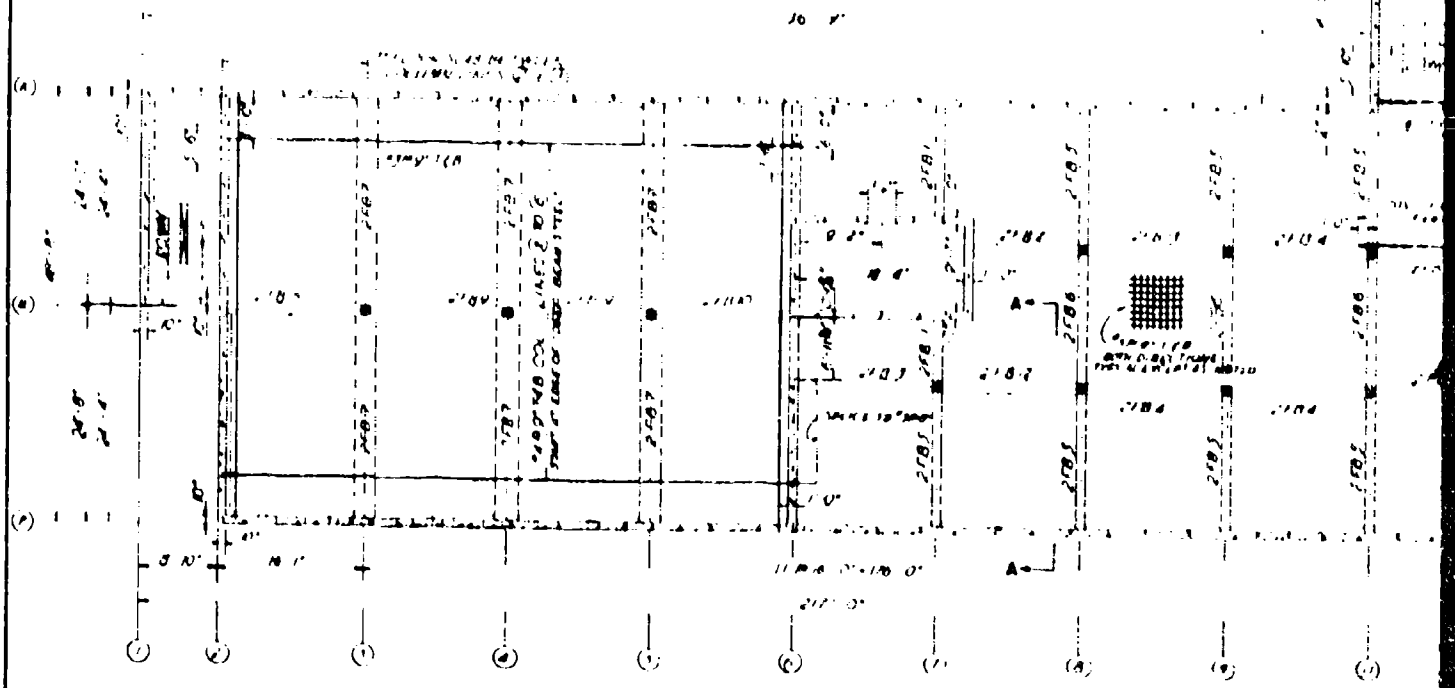




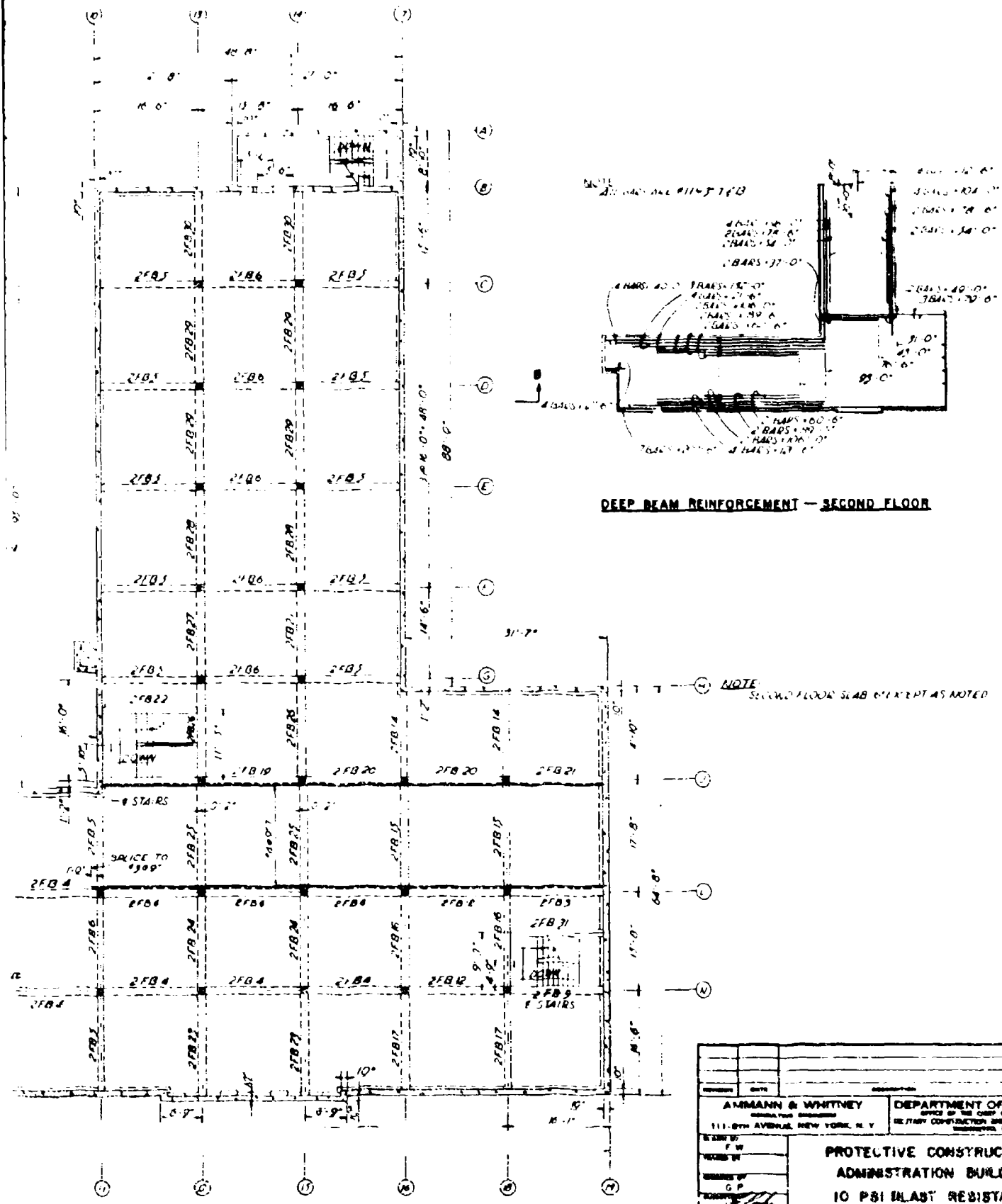
TYPICAL EXTERIOR BEAM DETAILS



TYPICAL INTERIOR BEAM DETAILS



SECOND FLOOR FRAMING PLAN


DEEP BEAM REINFORCEMENT — SECOND FLOOR
NOTE
SECOND FLOOR SLAB 6" EXCEPT AS NOTED
STAIRS
SPLICE TO
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10 PSI BLAST RESISTANT
60-16-CX
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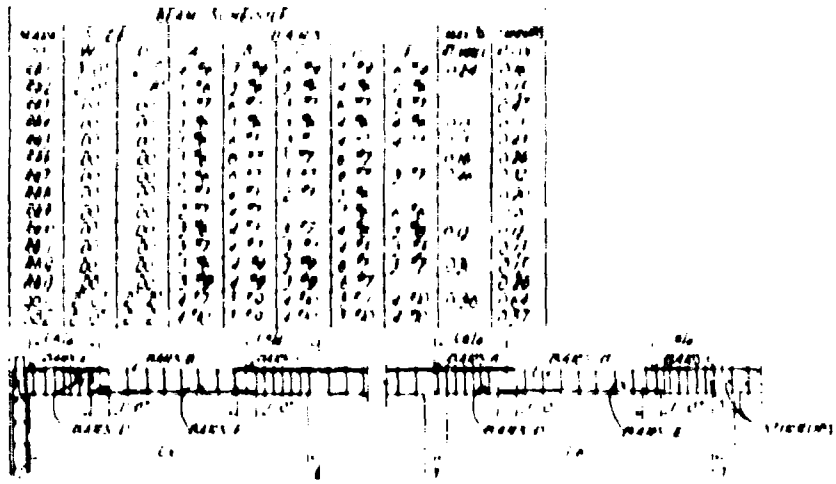
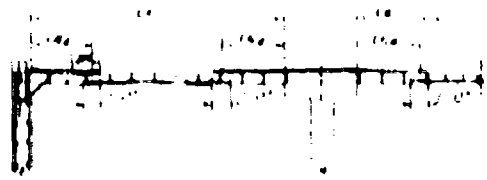
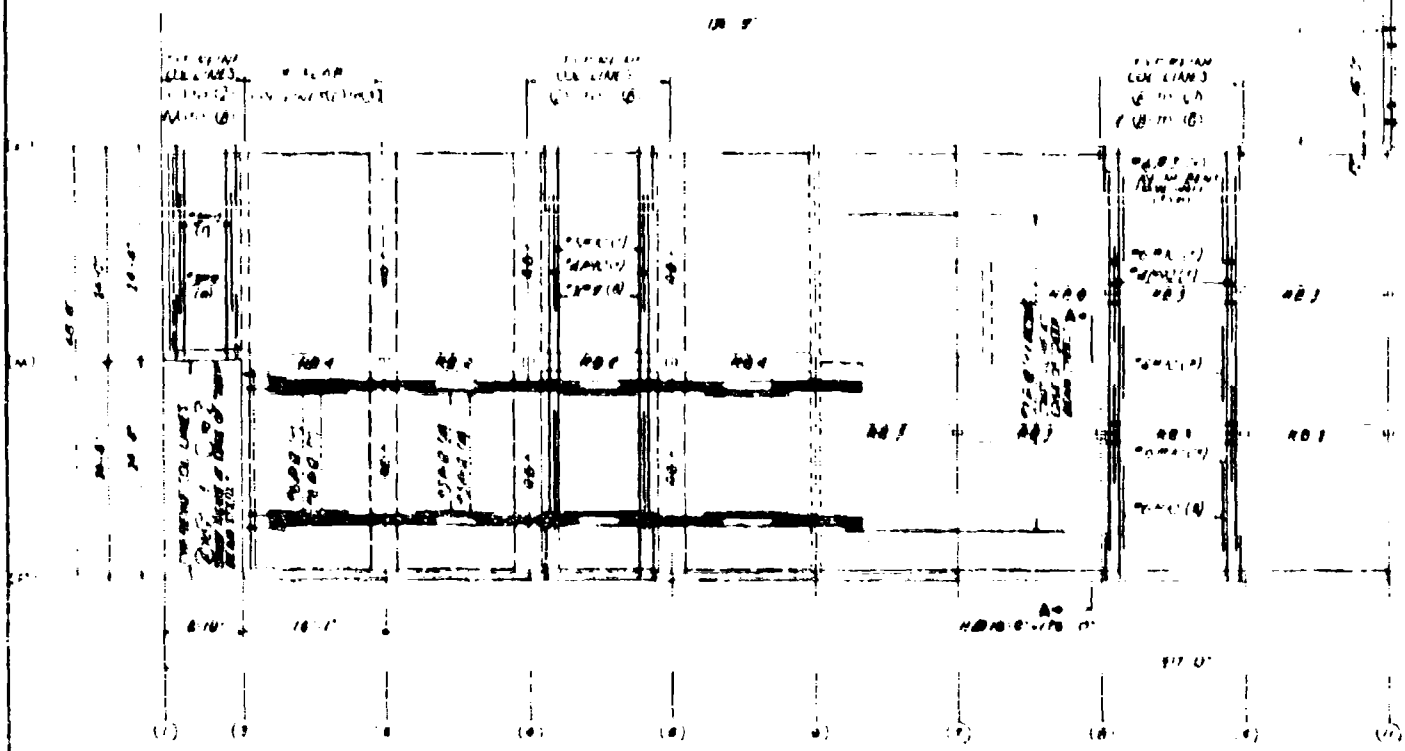


TYPICAL EXTERIOR BEAM DETAILS

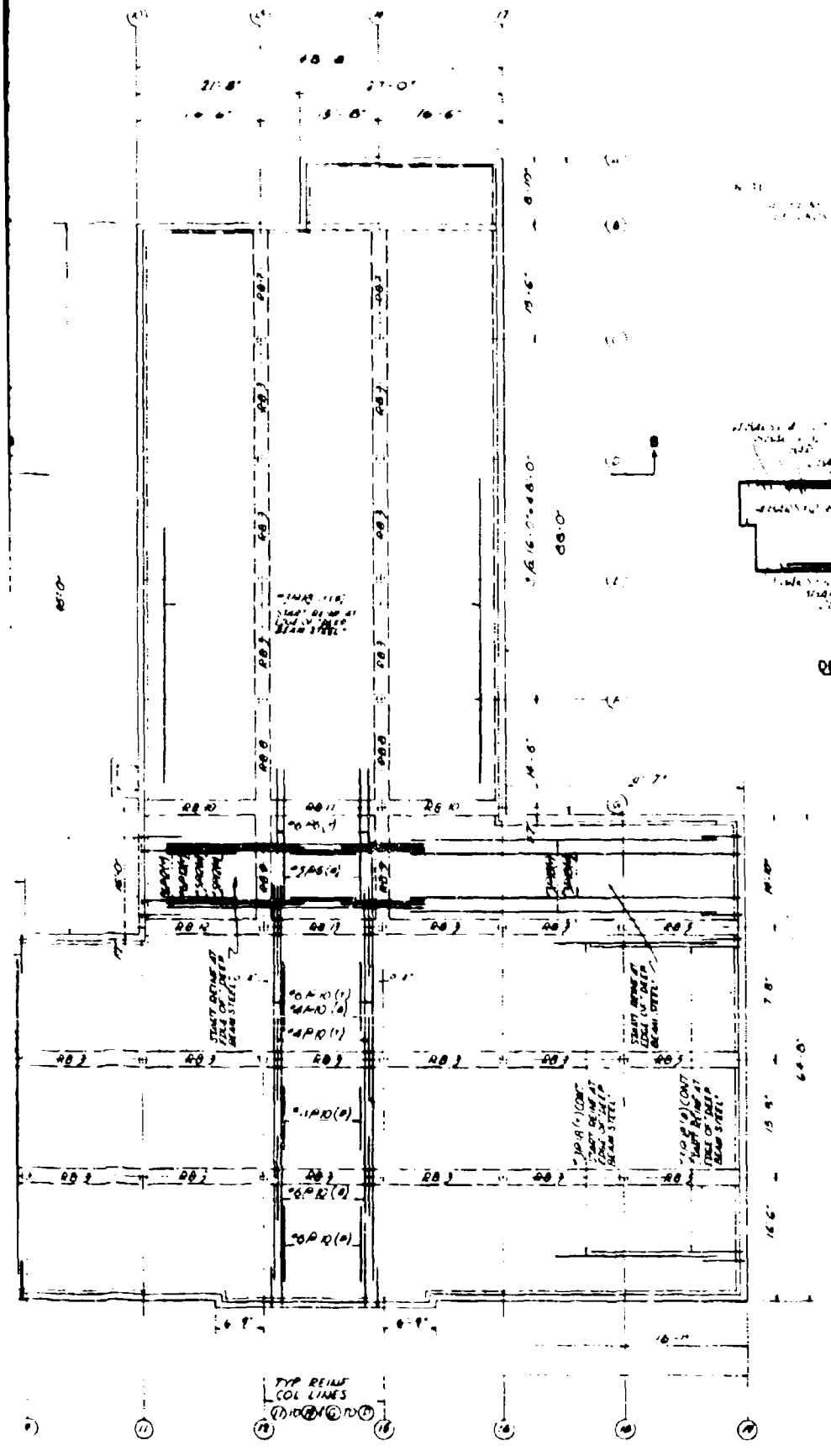
TYPICAL INTERIOR BEAM DETAILS

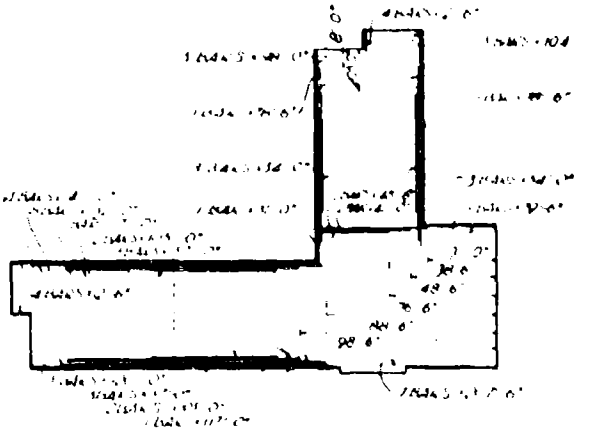


TYPICAL SLAB DETAILS



ROOF FRAMING PLAN





DEEP BEAM REINFORCEMENT - ROOF

NOTE: ROOF SLAB 7" CONCRETE AS NOTED

2

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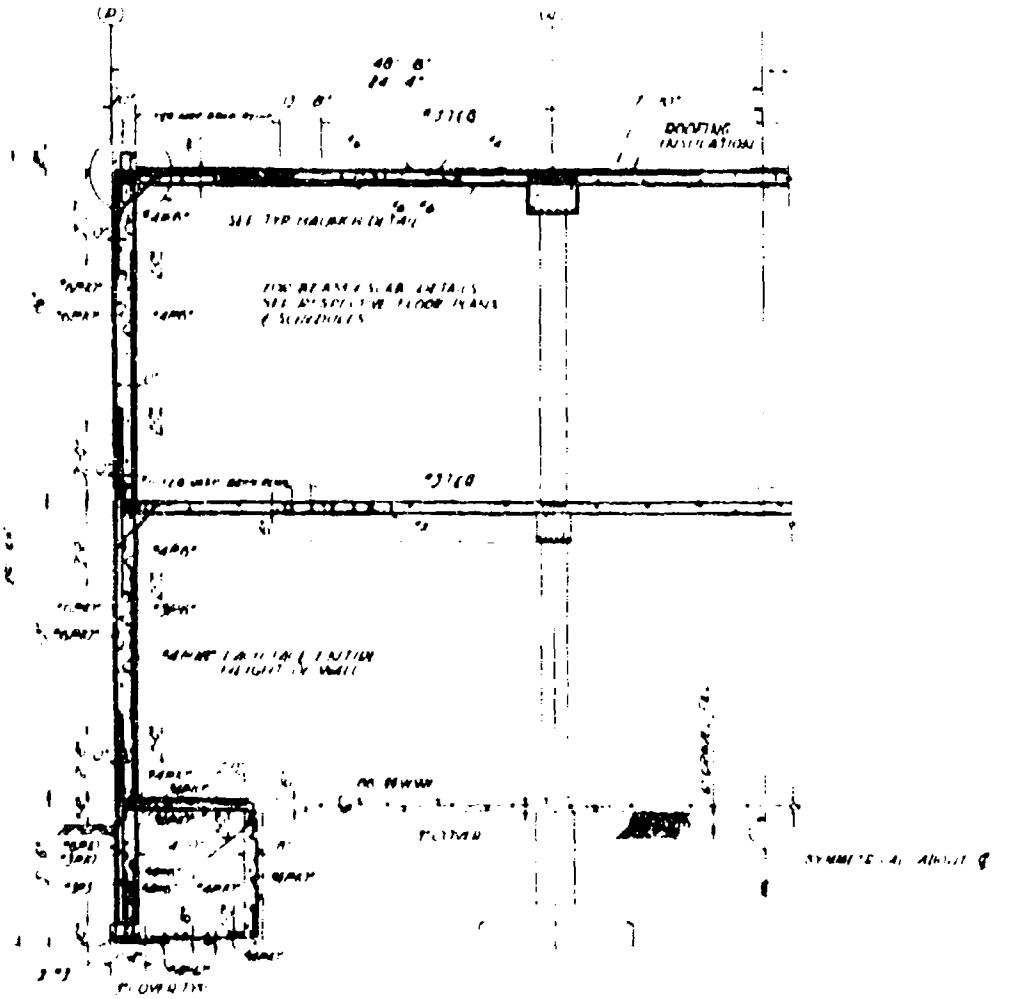
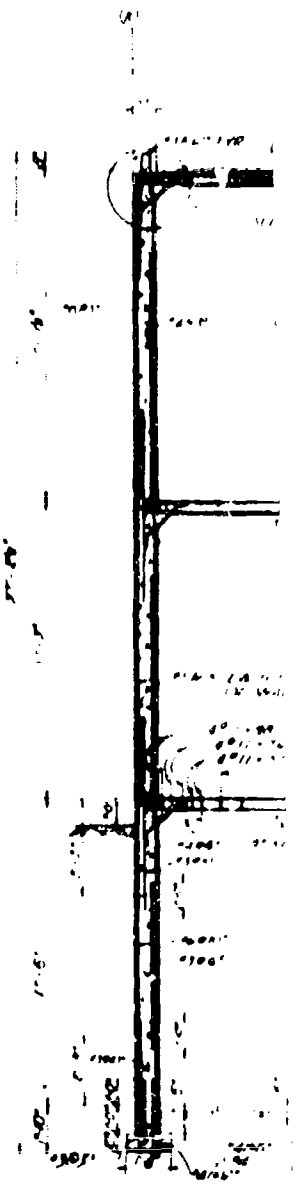
WASHINGTON, D.C.

PROTECTIVE CONSTRUCTIO
ADMINISTRATION BUILDING
10 PSI BLAST RESISTANT

DRAWING NUMBER
60-16-01

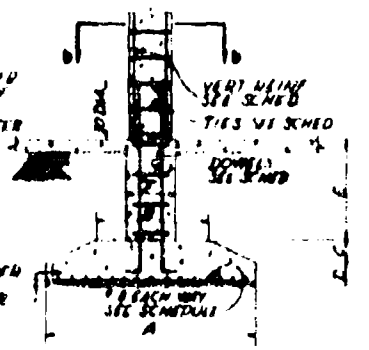


SECTION A-A

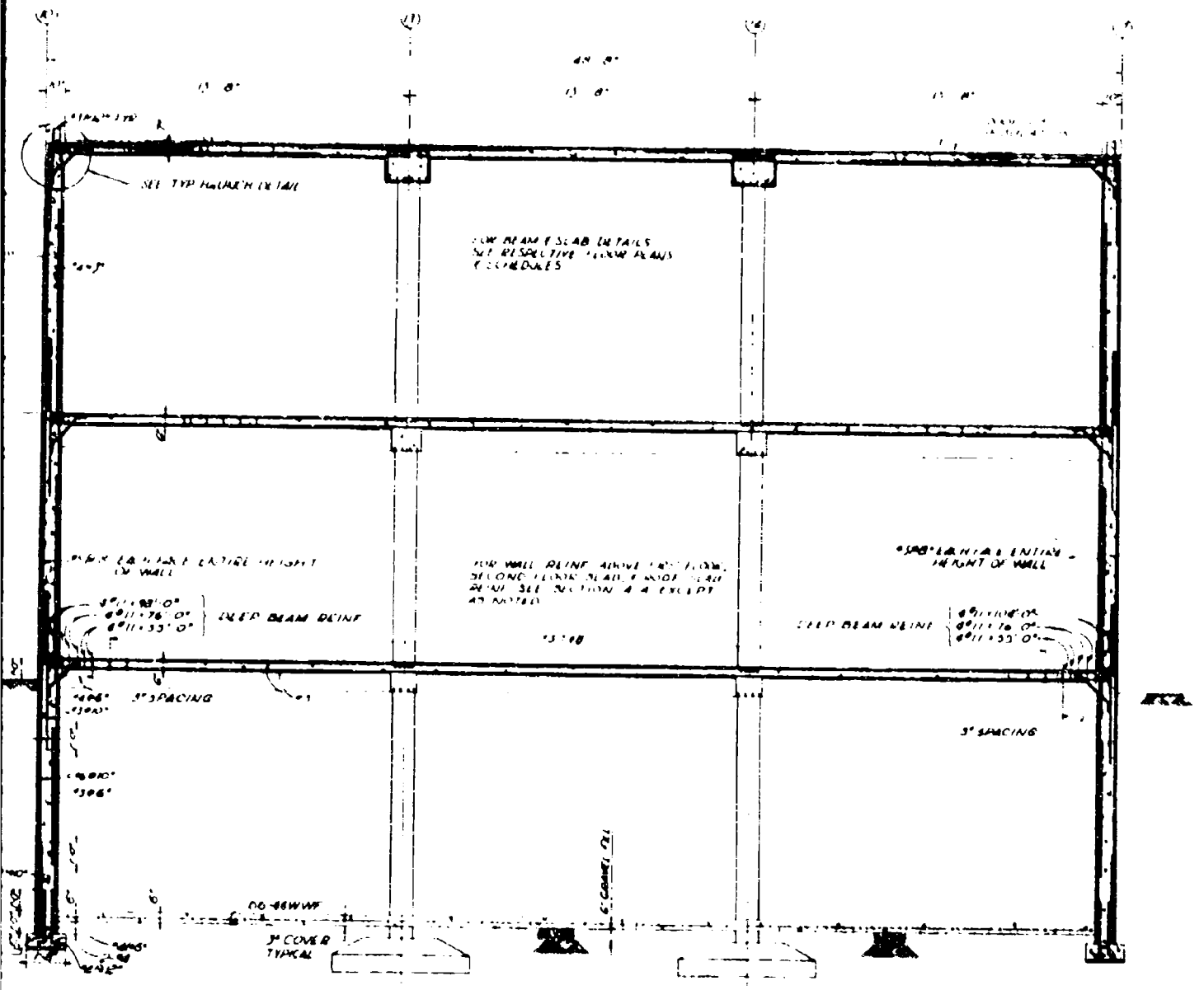


COLUMN & COLUMN FOOTING SCHEDULE

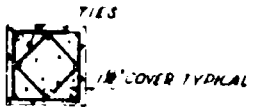
MARK NO.						
BOTTOM						
SIDE						
VERT BEND						
TIES						
BOTTOM						
SIDE						
VERT BEND						
TIES						
TOP						
SIDE						
VERT BEND						
TIES						
BOTTOM EL.						
DOWELS						
COLUMN						
REINF EACH WAY						



TYPICAL COLUMN FOOTING

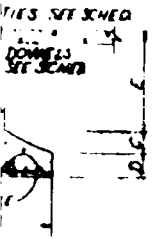


SECTION B-B
SCALE: 1/8" = 1'-0"

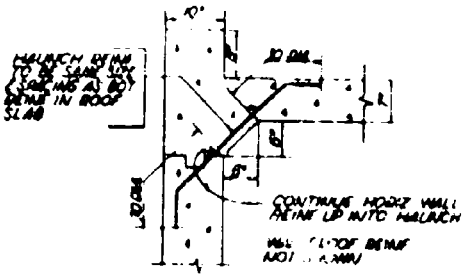


SECTION D-D

NOTE:
CONCRETE COVER TO REINFORCEMENT BARS IS AS FOLLOWS (EXCEPT AS NOTED)
BEAMS 1½"
SLABS ¾"
EXT WALLS ¾" INSIDE FACE
2" OUTSIDE FACE
INT WALLS ¾"



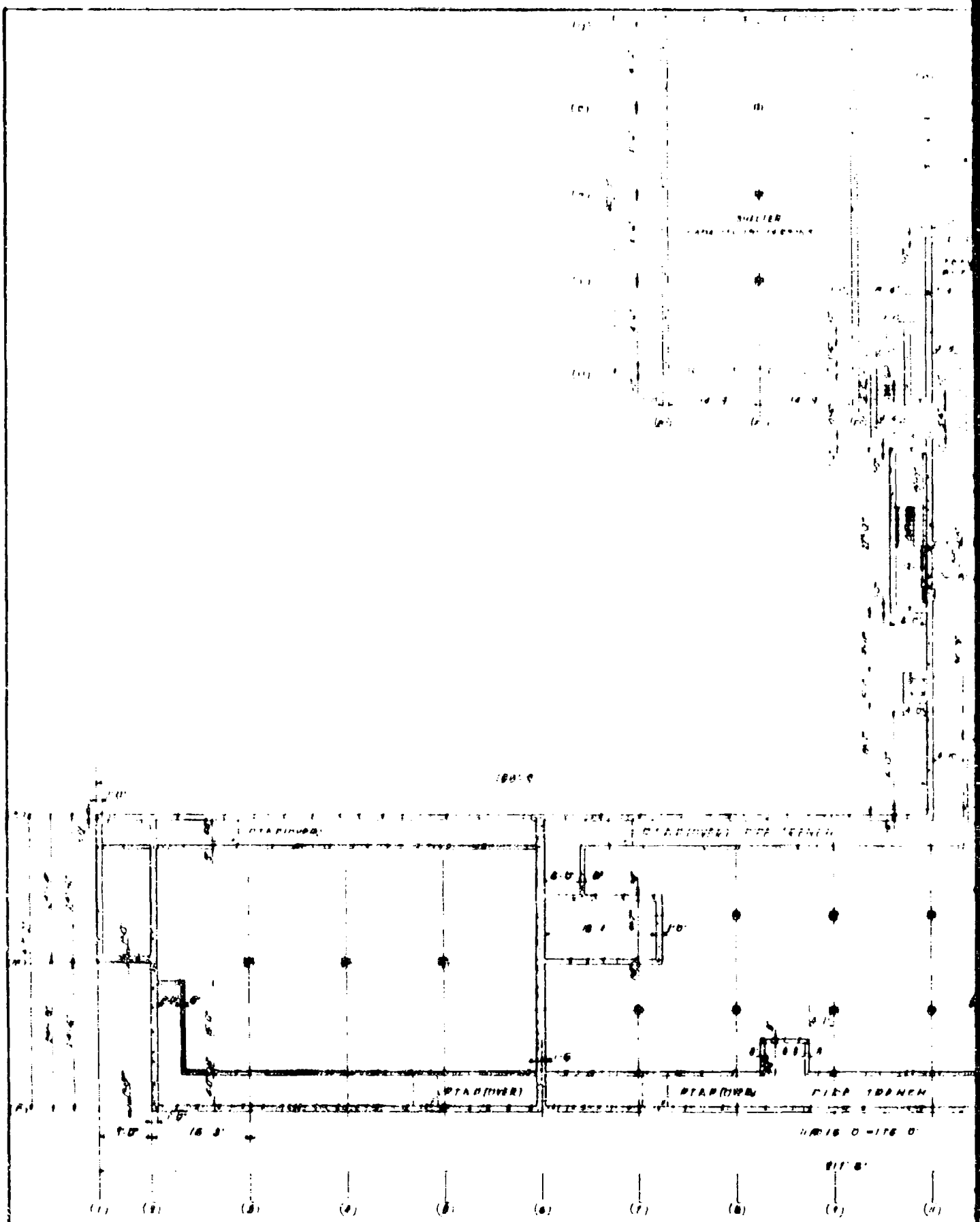
DOTING



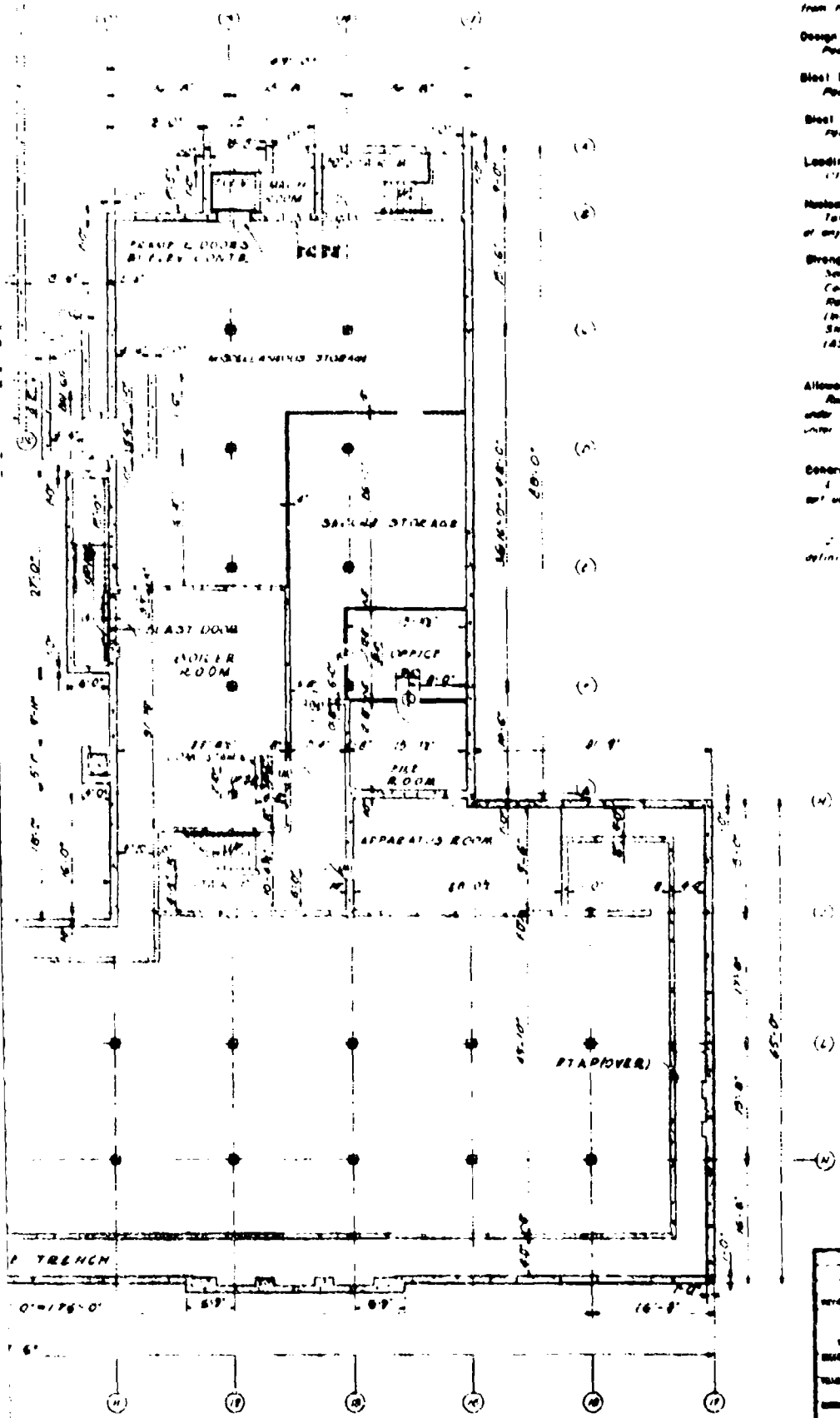
TYPICAL HAUNCH DETAIL
SCALE: 1" = 1'-0"

2

AMMANN & WHITNEY CONSULTING ENGINEERS 115 FIFTH AVENUE, NEW YORK, N.Y.	DEPARTMENT OF THE ARMY CORPS OF ENGINEERS, U.S. ARMY MILITARY CONSTRUCTION ENGINEERING DIVISION WASHINGTON, D.C.		
	PROTECTIVE CONSTRUCTION ADMINISTRATION BUILDING 10 PSI BLAST RESISTANT		
		AS NOTED	DRAWING NUMBER 60-19-01
			SHEET 9 OF 9



BASEMENT PLAN - ARCHITECTURAL



ARCHITECTURAL

DESIGN CONDITIONS

Design Procedure

In accordance with U.S. manual, "Design of Structures for Protection from the Effects of Atomic Weapons"

Design Blast Wave

Peak incident pressure - Pulse duration - sec.

Blast Loading On Roof

Peak pressure 20psi Duration - Floor

Blast Loading on Walls

Peak pressure - 20.5psi Duration - Floor

Loading on Floors

Office partion - 50psf, Corridors - 100psf

Nuclear Radiation Protection for Shelter Area

Total gamma and neutron attenuation in the [illegible] of any position which will produce a peak blast pressure [illegible] psi

Strength of Materials	Static	Blast Design
Soil bearing capacity	8,000psf*	[illegible]psf
Concrete, fc	4,000psi	[illegible]psi
Reinf steel, lower yield (bar under ASTM A305 50T)	47,500psi	52,000psi
Structural steel, lower yield (ASTM A7-50)	38,000psi	41,600psi

*rated capacity of soil

Allowable Stresses and Deflections

Roof, walls, columns and footings designed for plastic deformations under [illegible] Roof slab designed for elastic deformation under design blast load

General Notes

1. The following features are not shown and shall be determined by [illegible] representatives
   - Mechanical and electrical equipment
   - Air locks and decontamination facilities
2. This design study is based upon Dept. of the Air Force definitive drawing No. [illegible] (U) Wallace AFB Drawing No. [illegible]

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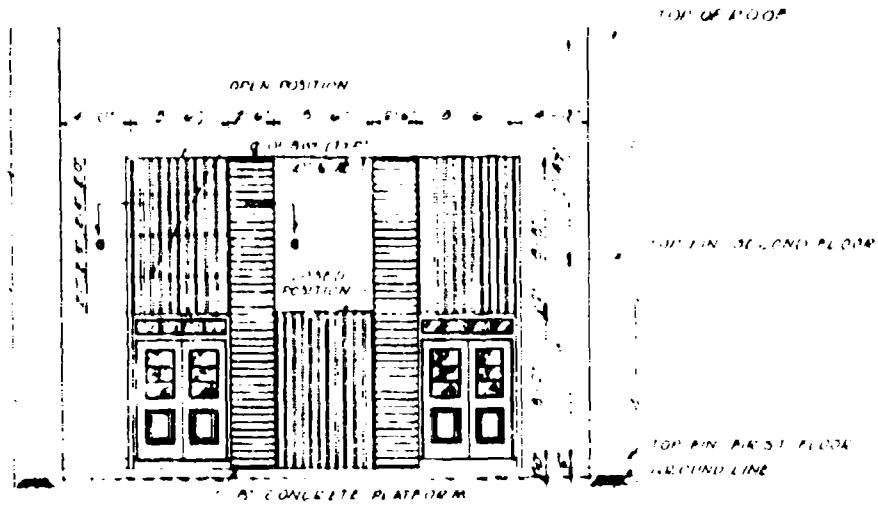
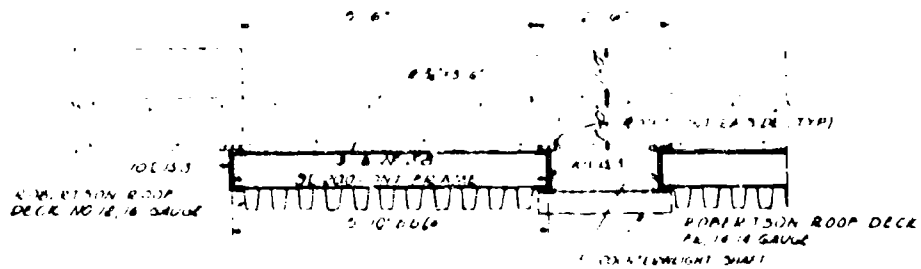
DRAWN BY D.H.	PROTECTIVE CONSTRUCTION ADMINISTRATION BUILDING 20 PSI BLAST RESISTANT
DESIGNED BY Q.A.	
	60-16-01
	SHEET 1 OF 9

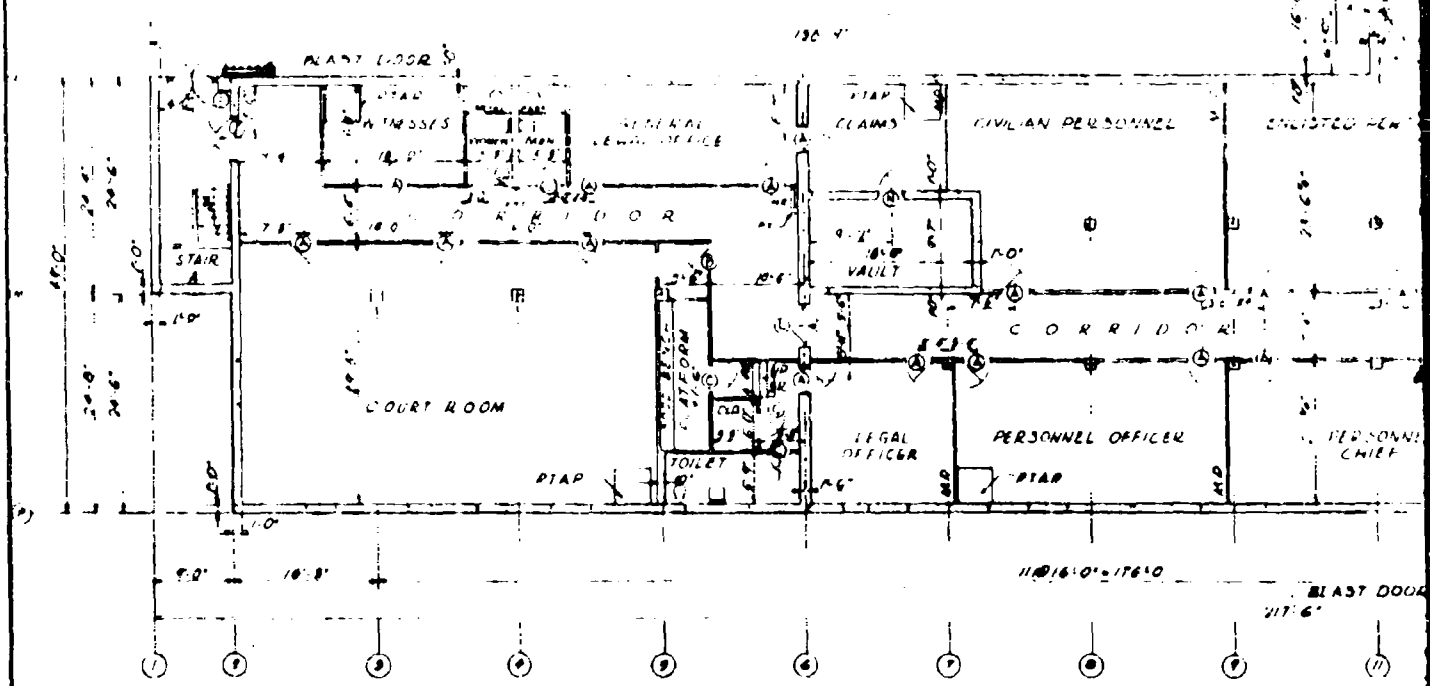
2



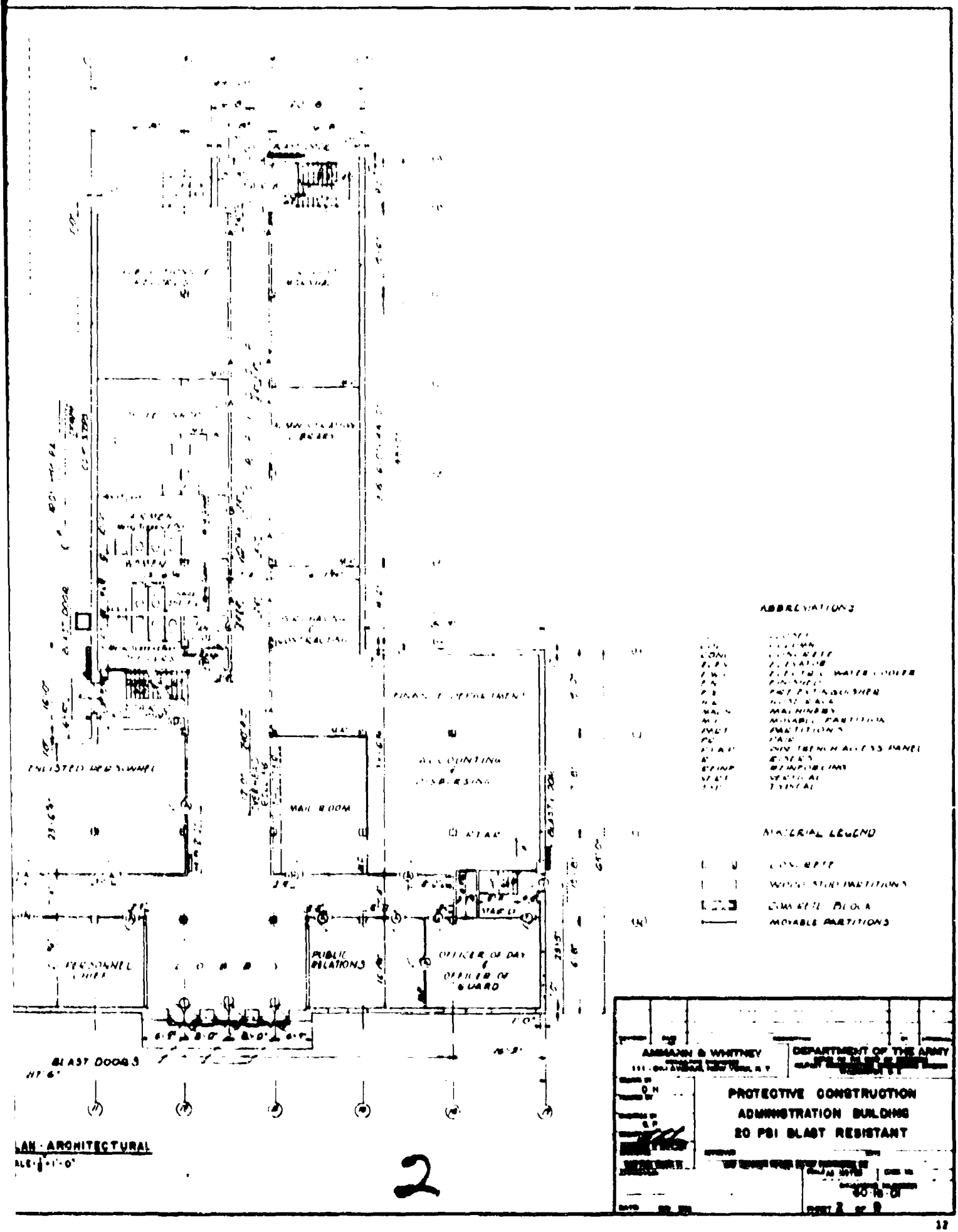
ELEVATION OF MAIN DOORS
SCALE $\frac{1}{8}$"=1'-0"



SECTION a-a
SCALE $\frac{1}{8}$"=1'-0"



FIRST FLOOR PLAN - ARCHITECTU
SCALE $\frac{1}{8}$"=1'-0"


ENLISTED MEN'S WAIT
MAIL ROOM
ACCOUNTING
PUBLIC RELATIONS
OFFICER OF DAY
OFFICER OF GUARD
BLAST DOORS
ABBREVIATIONS
MATERIAL LEGEND
CONCRETE
WOOD STUD PARTITIONS
CONCRETE BLOCK
MOVABLE PARTITIONS
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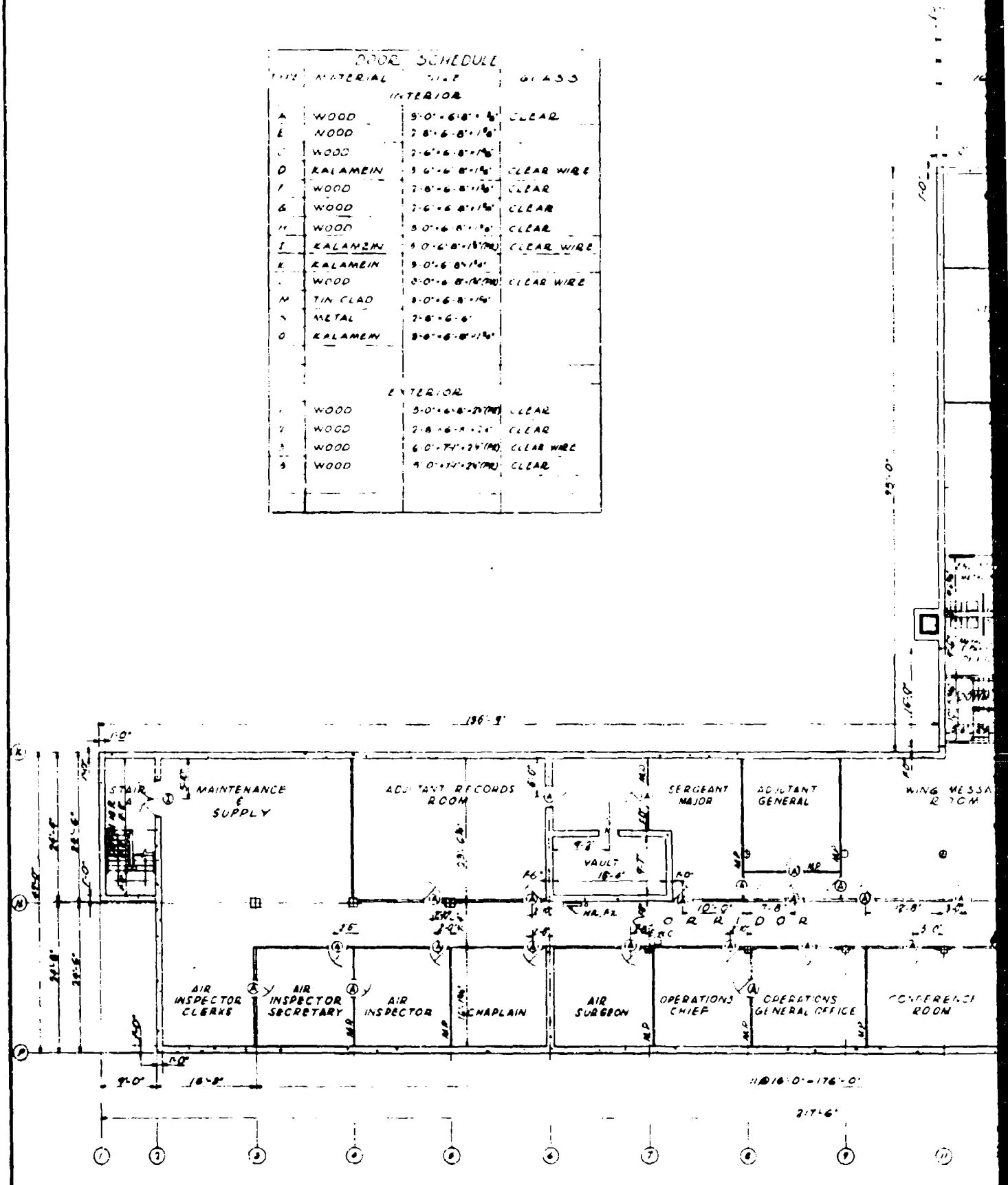
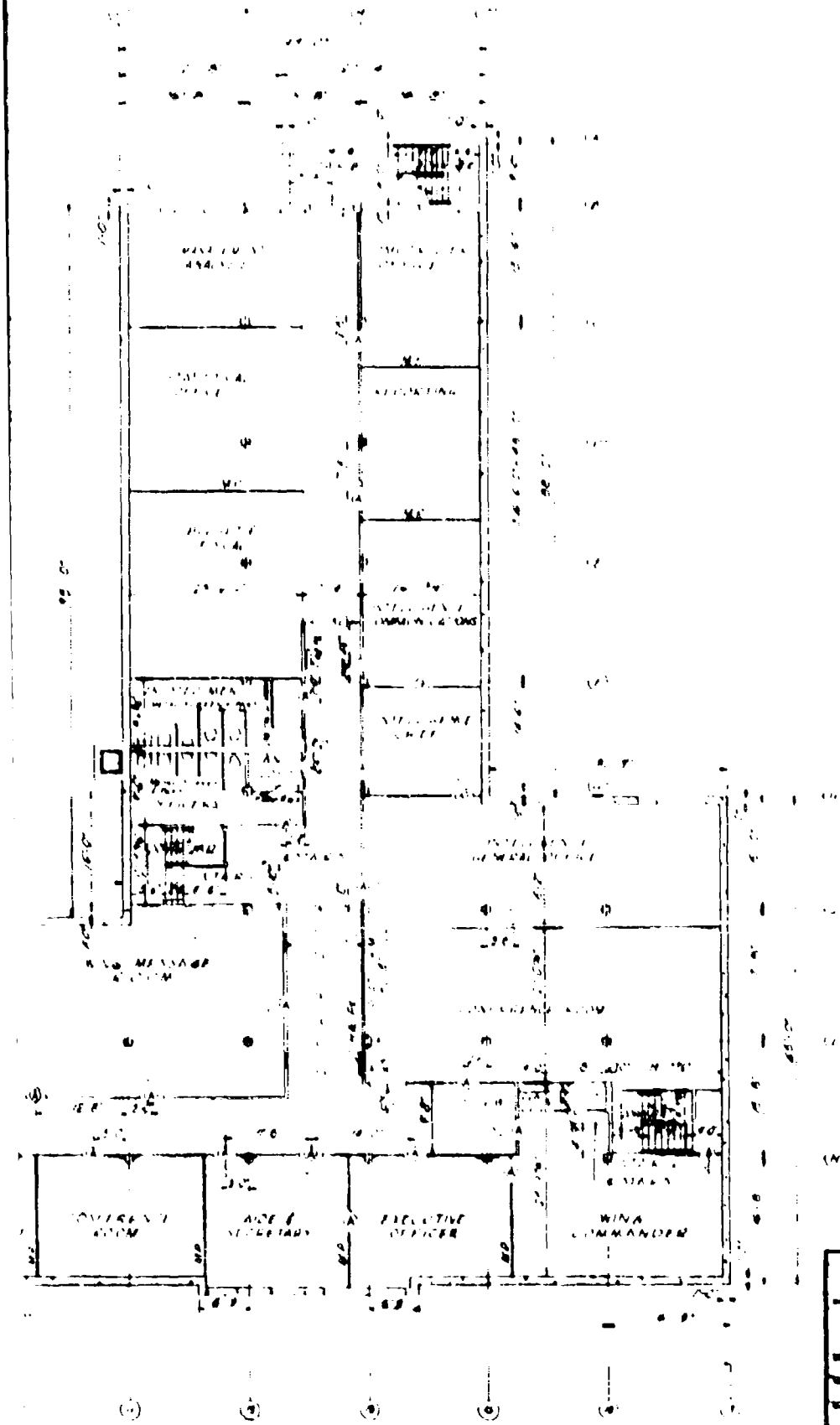
PROTECTIVE CONSTRUCTION
ADMINISTRATION BUILDING
20 PSI BLAST RESISTANT
LAN - ARCHITECTURAL
2

DOOR SCHEDULE

TYPE	MATERIAL	SIZE	GLASS
		INTERIOR	
A	WOOD	3'-0" × 6'-8" × 1 3/8"	CLEAR
E	WOOD	2'-8" × 6'-8" × 1 3/8"	
C	WOOD	2'-6" × 6'-8" × 1 3/8"	
D	KALAMEIN	3'-0" × 6'-8" × 1 3/8"	CLEAR WIRE
F	WOOD	2'-8" × 6'-8" × 1 3/8"	CLEAR
G	WOOD	2'-6" × 6'-8" × 1 3/8"	CLEAR
H	WOOD	3'-0" × 6'-8" × 1 3/8"	CLEAR
I	KALAMEIN	3'-0" × 6'-8" × 1 3/8" (PR)	CLEAR WIRE
K	KALAMEIN	3'-0" × 6'-8" × 1 3/8"	
L	WOOD	3'-0" × 6'-8" × 1 3/8" (PR)	CLEAR WIRE
M	TIN CLAD	3'-0" × 6'-8" × 1 3/8"	
N	METAL	2'-8" × 6'-6"	
O	KALAMEIN	3'-0" × 6'-8" × 1 3/8"	
		EXTERIOR	
1	WOOD	3'-0" × 6'-8" × 2 1/4" (PR)	CLEAR
2	WOOD	2'-8" × 6'-8" × 2 1/4"	CLEAR
3	WOOD	6'-0" × 7'-4" × 2 1/4" (PR)	CLEAR WIRE
4	WOOD	3'-0" × 7'-4" × 2 1/4" (PR)	CLEAR



SECOND FLOOR PLAN



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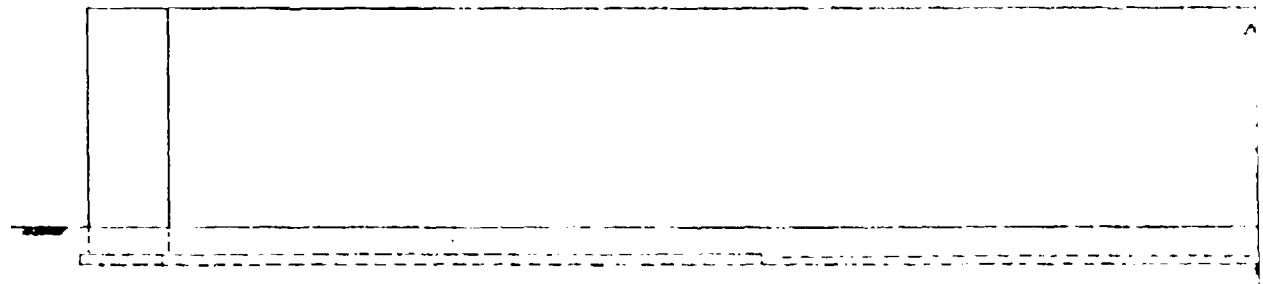
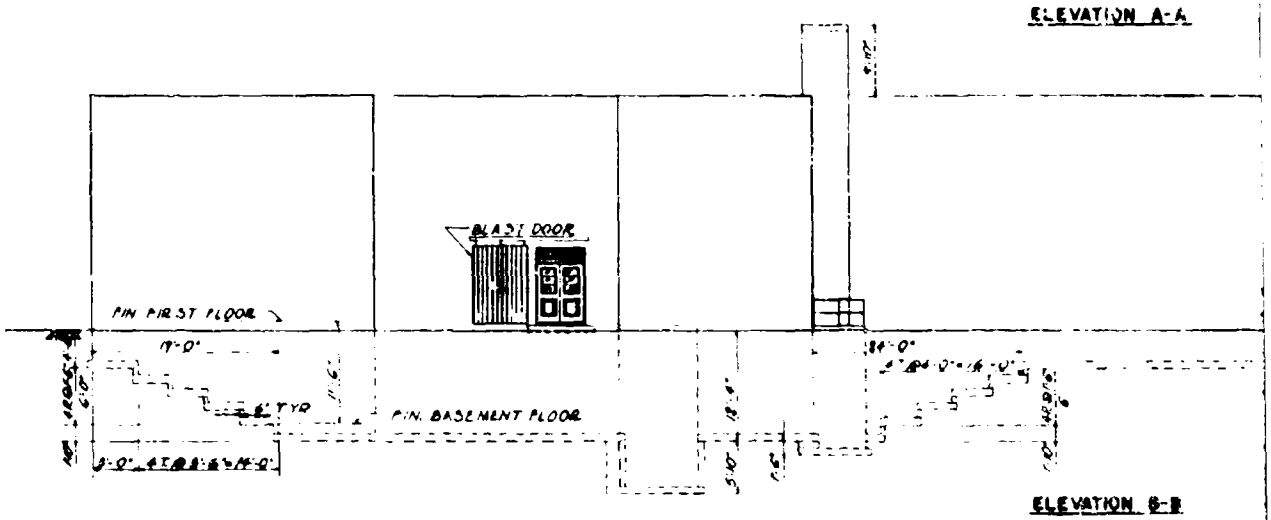
ADMINISTRATION BUILDING
20 PSI BLAST RESISTANT

80-B-01

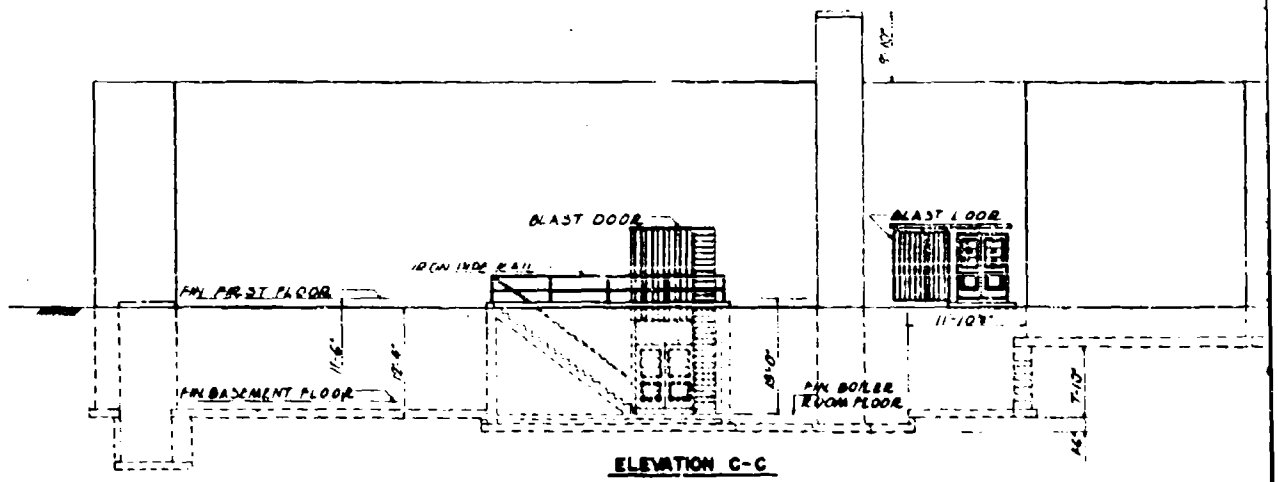
2



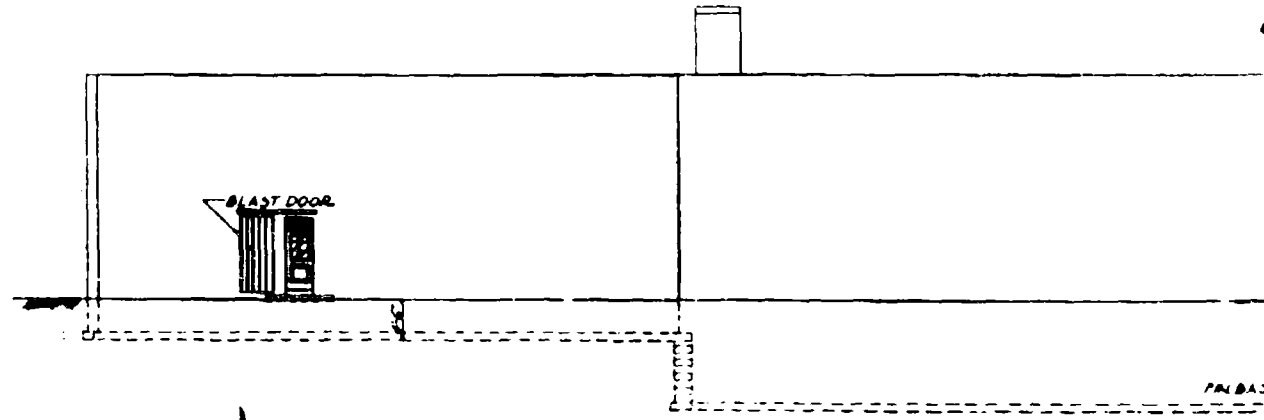
ELEVATION A-A



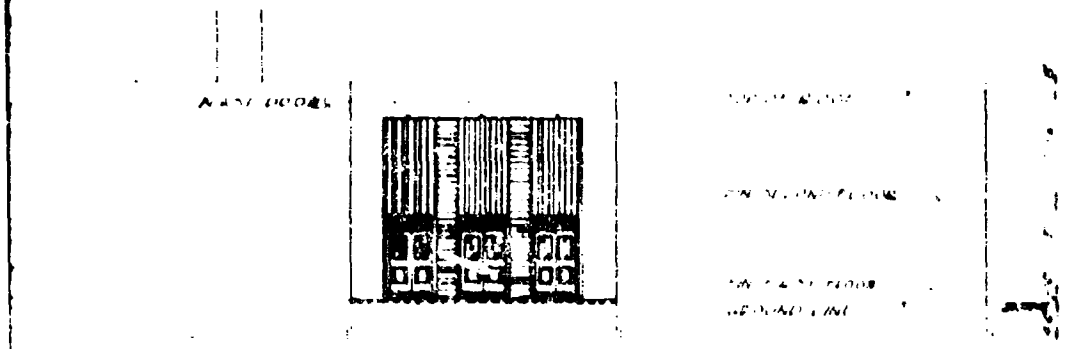
ELEVATION B-B



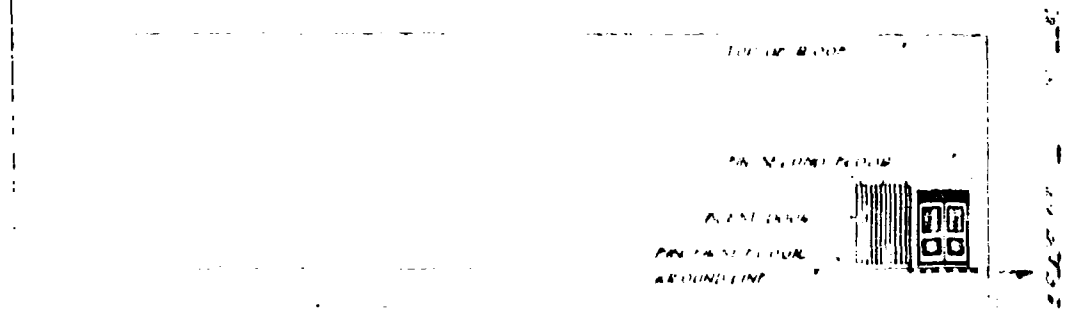
ELEVATION C-C



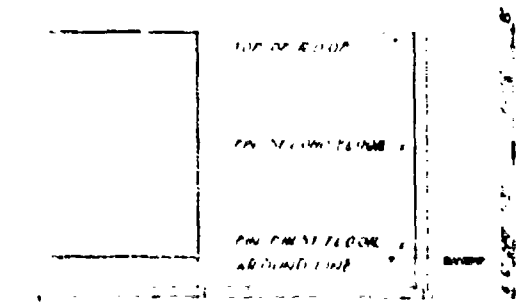
ELEVATION D-D

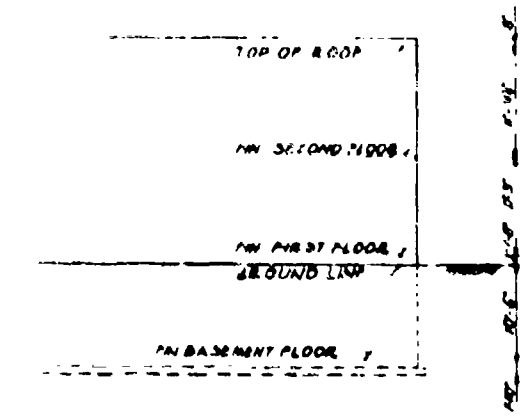


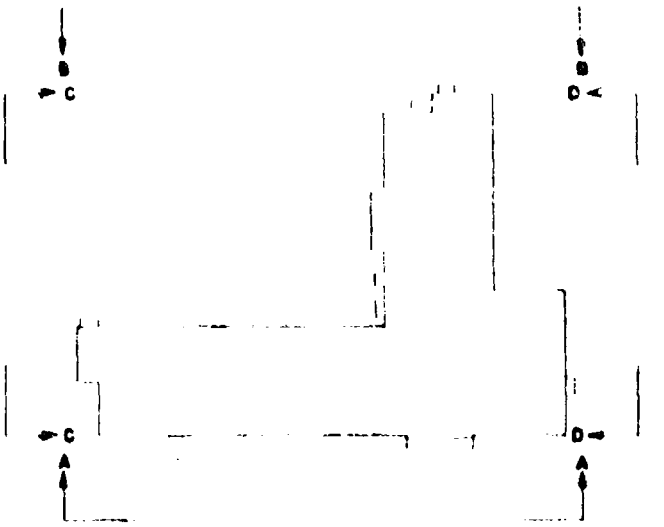
ELEVATION A-A



ELEVATION B-B







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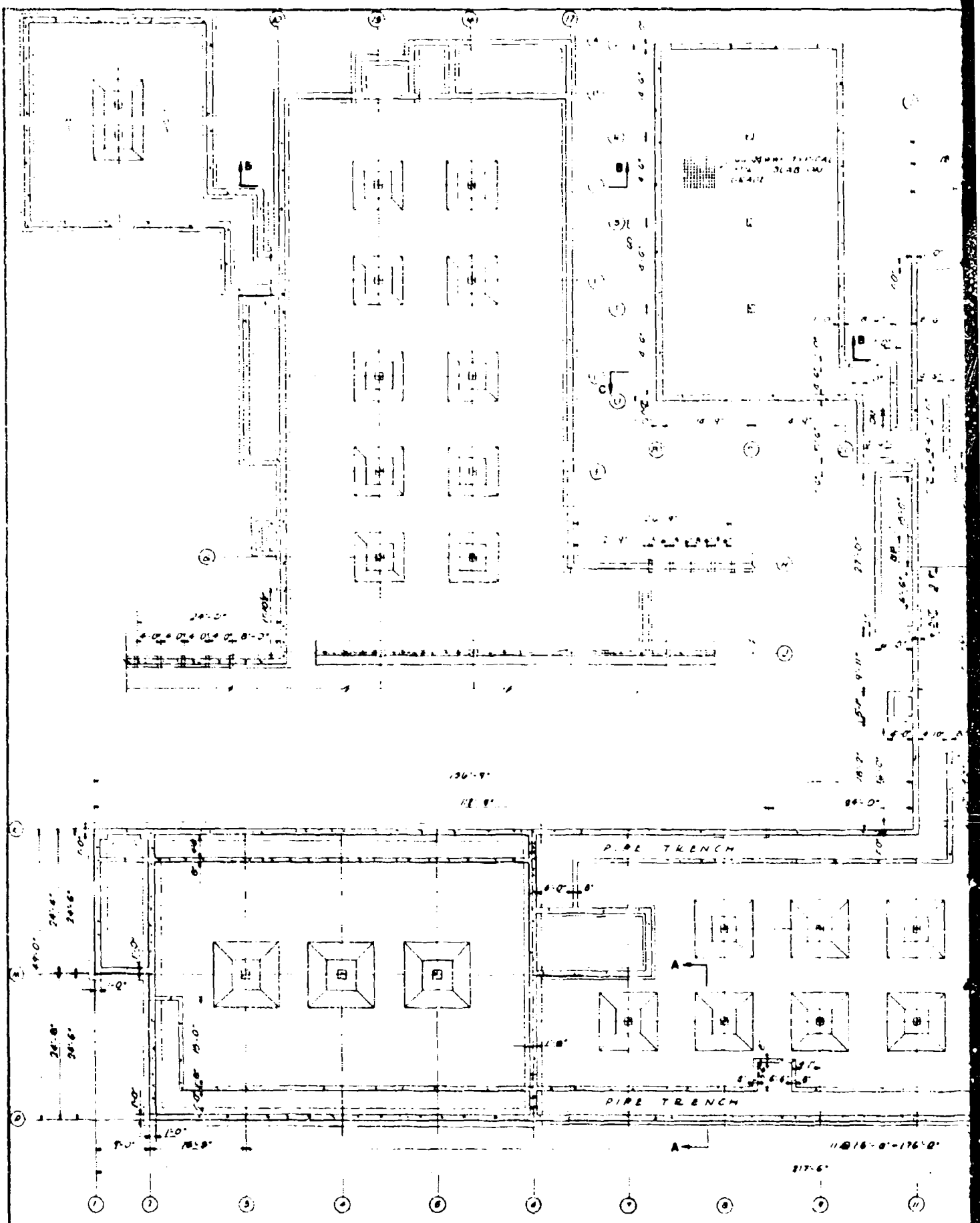
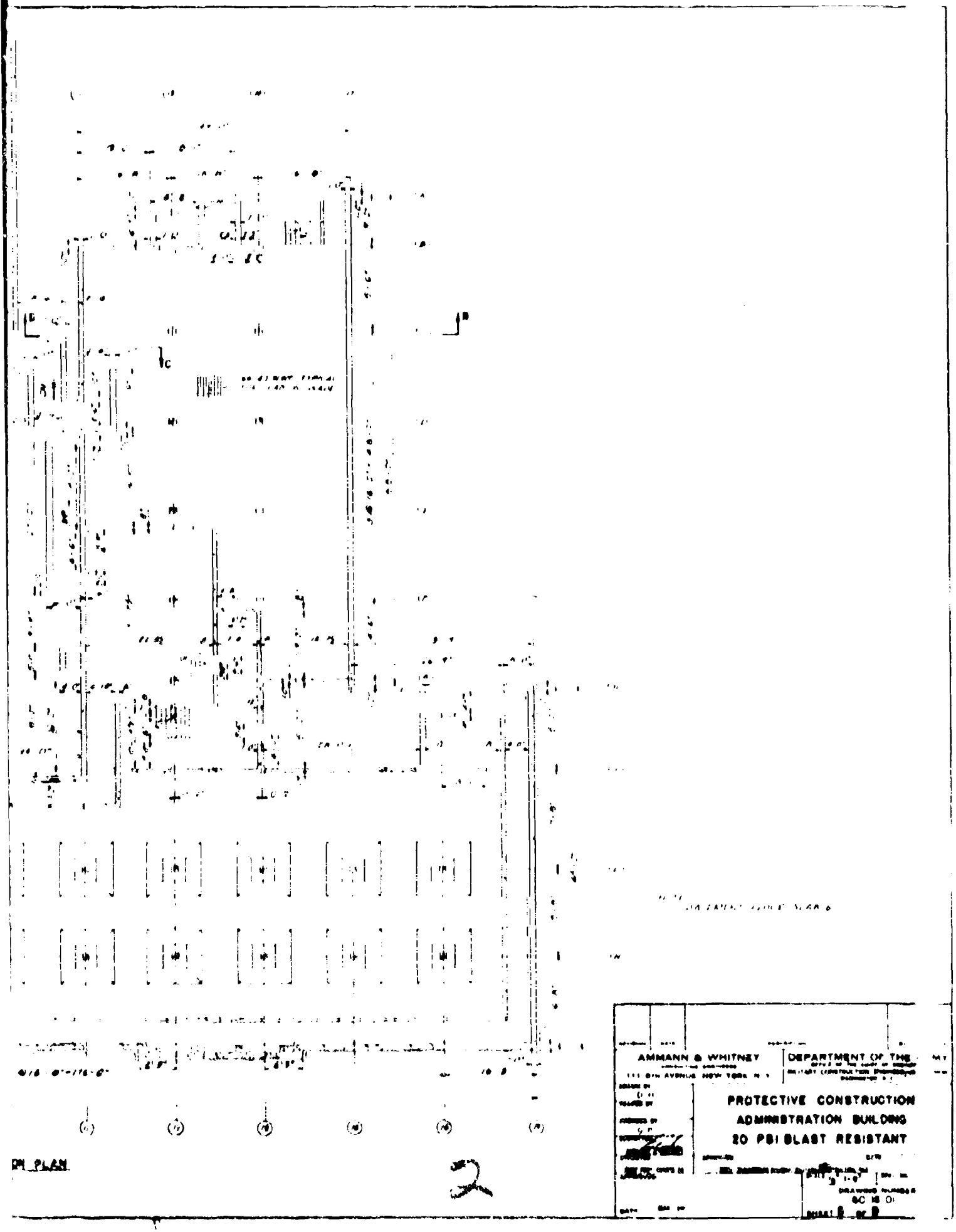
PROTECTIVE CONSTRUCTION
ADMINISTRATION BUILDING
50 PSI BLAST RESISTANT

60-16-01

2



BASEMENT AND FOUNDATION PLAN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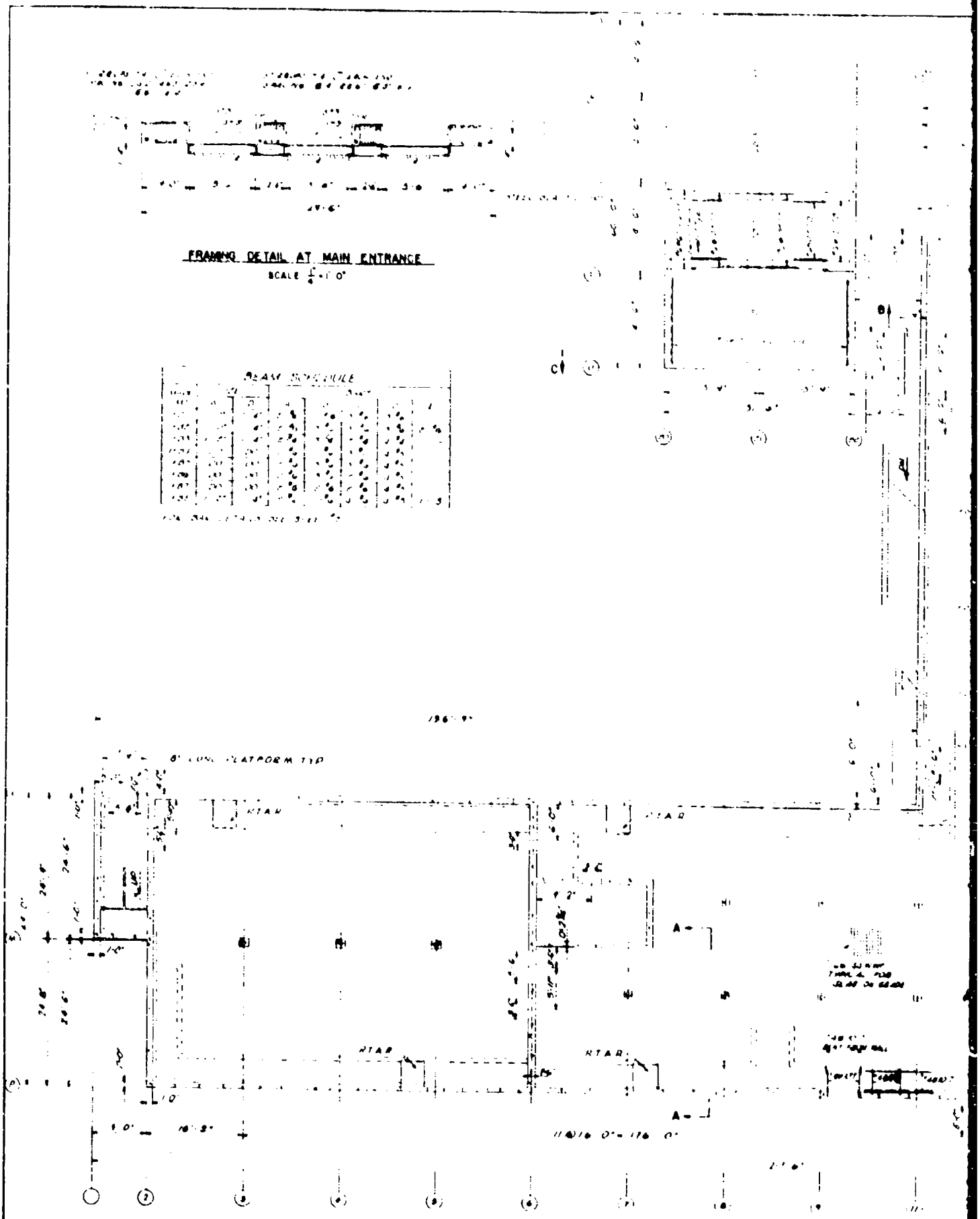
DEPARTMENT OF THE
PROTECTIVE CONSTRUCTION
ADMINISTRATION BUILDING
20 PSI BLAST RESISTANT
PLAN



FIRST FLOOR AND SHELTER ROOF FRAMING PLAN

SECTION C C

FRAMING PLAN

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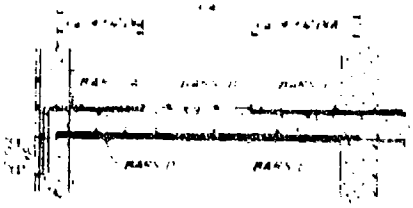
PROTECTIVE CONSTRUCTION
ADMINISTRATION BUILDING
20 PSI BLAST RESISTANT

BEAM SCHEDULE

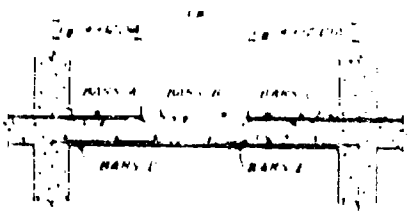
MARK NO.	SIZE W	SIZE D	BARS A	BARS B	BARS C	BARS D	BARS E
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

BEAM SCHEDULE

MARK NO.	SIZE W	SIZE D	BARS A	BARS B	BARS C	BARS D	BARS E
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]



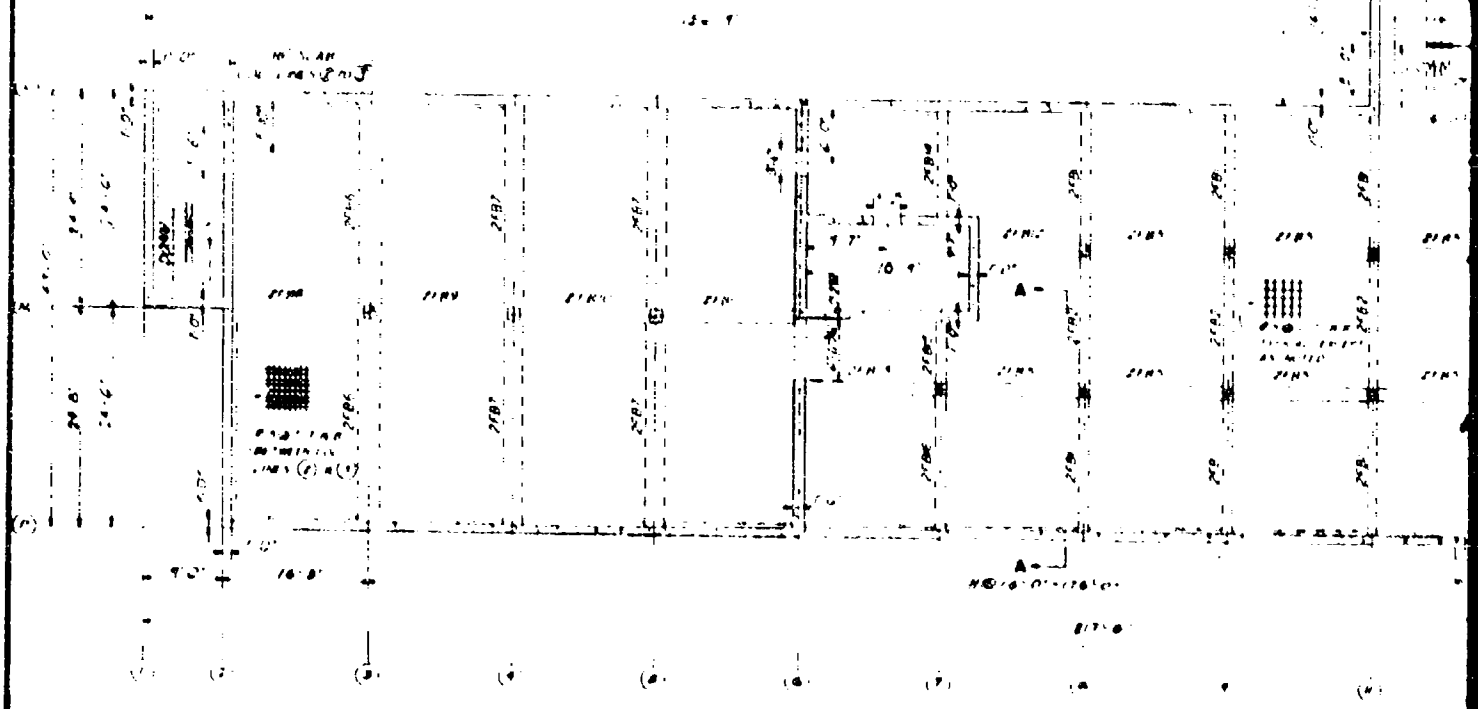
TYPICAL EXTERIOR BEAM DETAILS



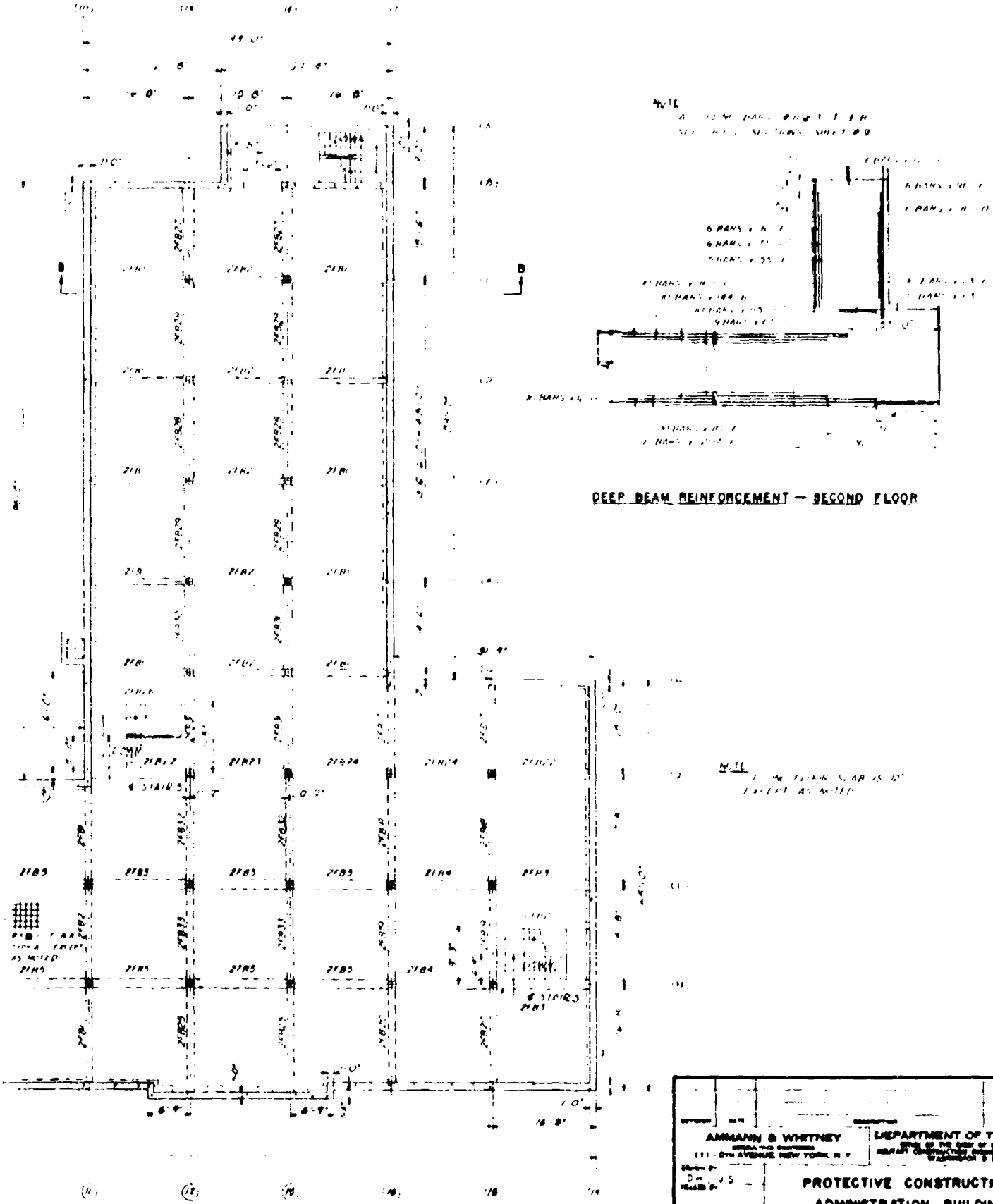
TYPICAL INTERIOR BEAM DETAILS

NOTE

[illegible]



SECOND FLOOR FRAMING PLAN


DEEP BEAM REINFORCEMENT — SECOND FLOOR
AMMANN & WHITNEY
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PROTECTIVE CONSTRUCTION
ADMINISTRATION BUILDING
20 PSI BLAST RESISTANT
60-16-01

2

BEAM SCHEDULE

MARK NO.	SIZE W	SIZE D	BARS A	BARS B	BARS C	BARS D	BARS E	MAX. STIRRUPS AT WALL	MAX. STIRRUPS AT COL.
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]
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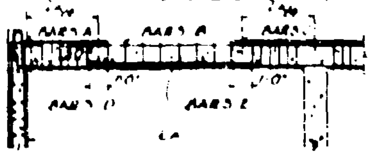
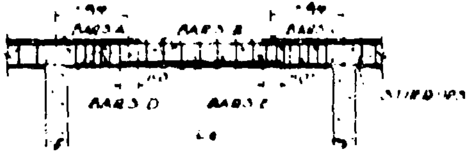
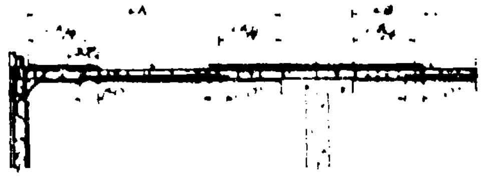


TYPICAL EXTERIOR BEAM DETAILS



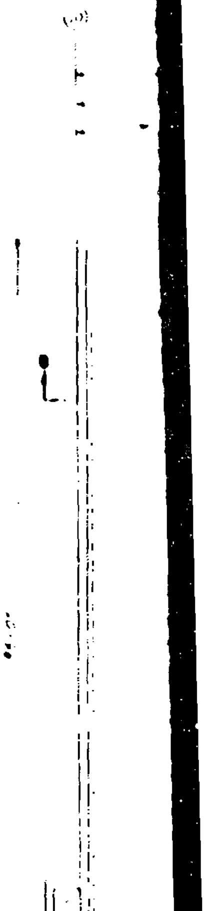
TYPICAL INTERIOR BEAM DETAILS

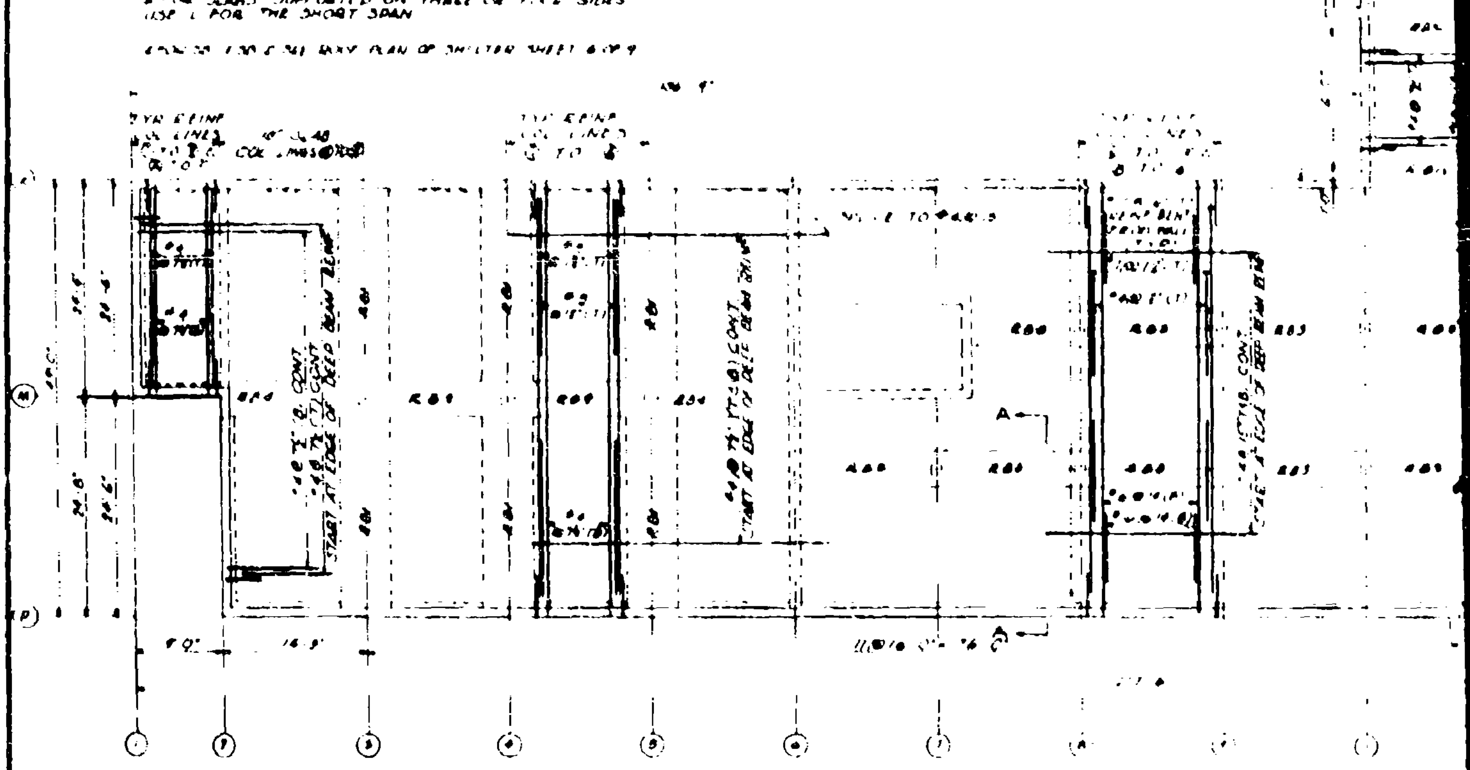


TYPICAL SLAB DETAILS

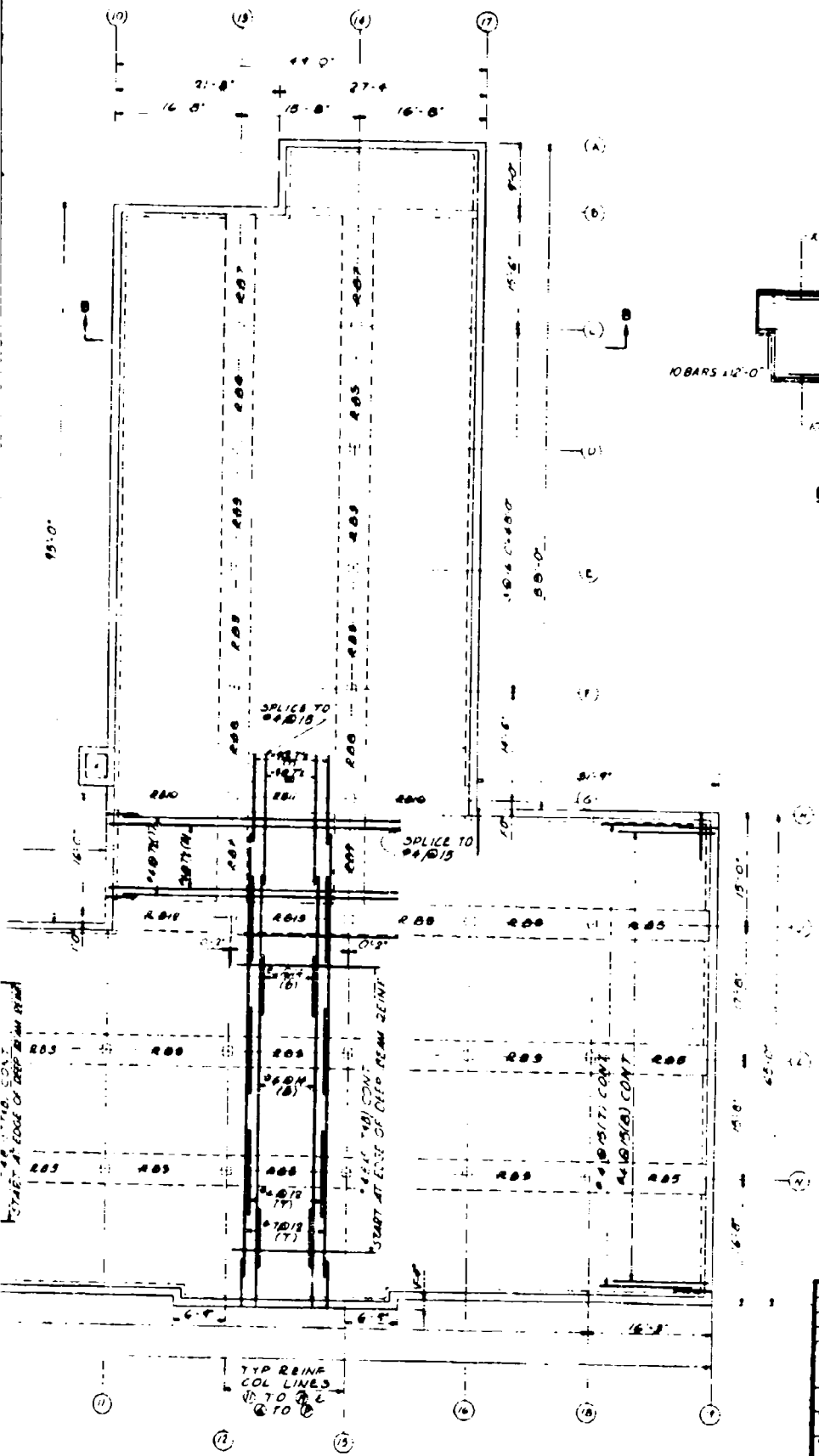
NOTES

1. FOR BEAMS & SLABS ALL REINF. [illegible] TO BE A MINIMUM OF 30 DIA. AT [illegible] OF SPAN
2. FOR BEAMS ANY ALLOWABLE STIRRUPS TO BE [illegible]
3. FOR SLABS SUPPORTED ON THREE OR FOUR SIDES USE [illegible] FOR THE SHORT SPAN
4. [illegible] PLAN OF SHELTER SHEET [illegible]

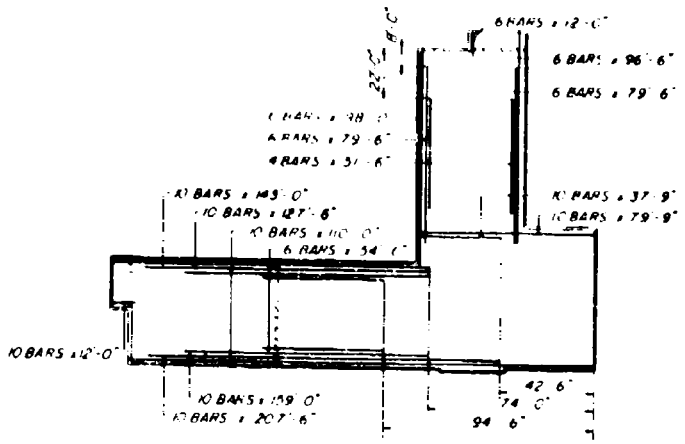




ROOF FRAMING PLAN



NOTE
ALL REINF. BARS #11@ 3" T & B
SEE CROSS-SECTIONS, SHEET #9



DEEP BEAM REINFORCEMENT — ROOF

NOTE: ROOF SLAB 11" EXCEPT AS NOTED

AMMANN & WHITNEY
CONSULTING ENGINEERS
111 - 8TH AVENUE, NEW YORK, N.Y.

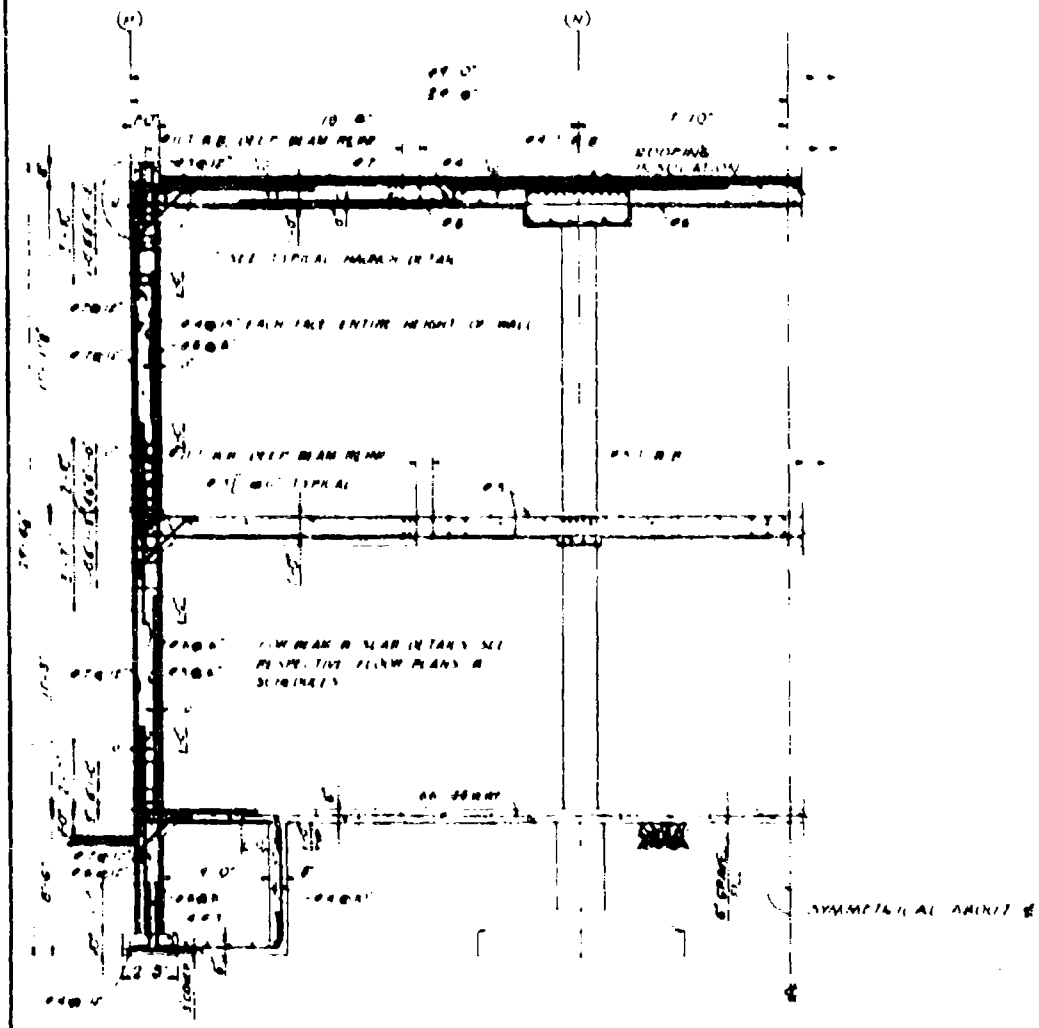
DEPARTMENT OF THE ARMY
OFFICE OF THE CHIEF OF ENGINEERS
MILITARY CONSTRUCTION DIVISION
WASHINGTON, D.C.

DRAWN BY: D.H.
DESIGNED BY: G.P.

PROTECTIVE CONSTRUCTION
ADMINISTRATION BUILDING
20 PSI BLAST RESISTANT

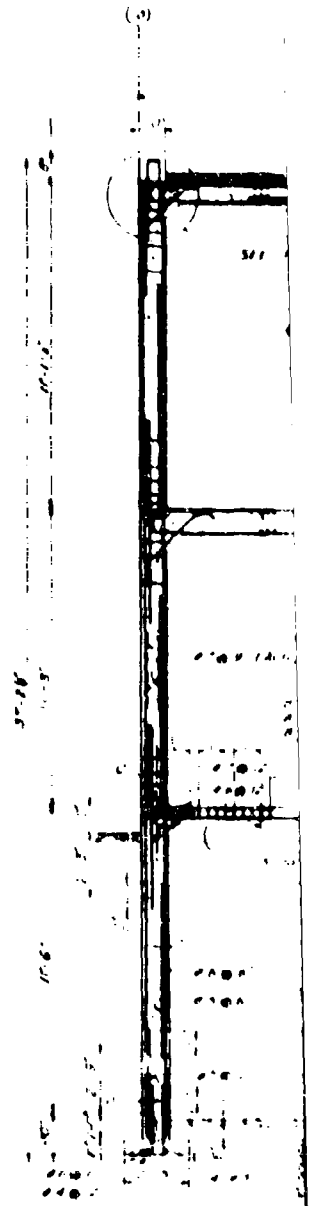
SCALE: 1/4" = 1'-0"
DRAWING NUMBER: 60-16-01
SHEET 8 OF 8

2

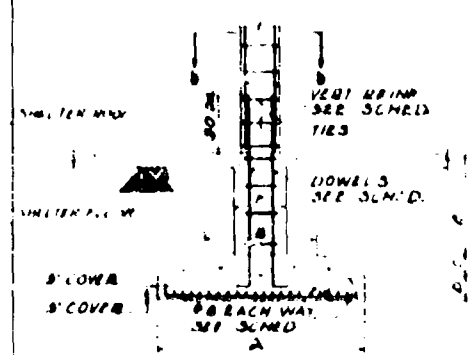


SECTION A-A

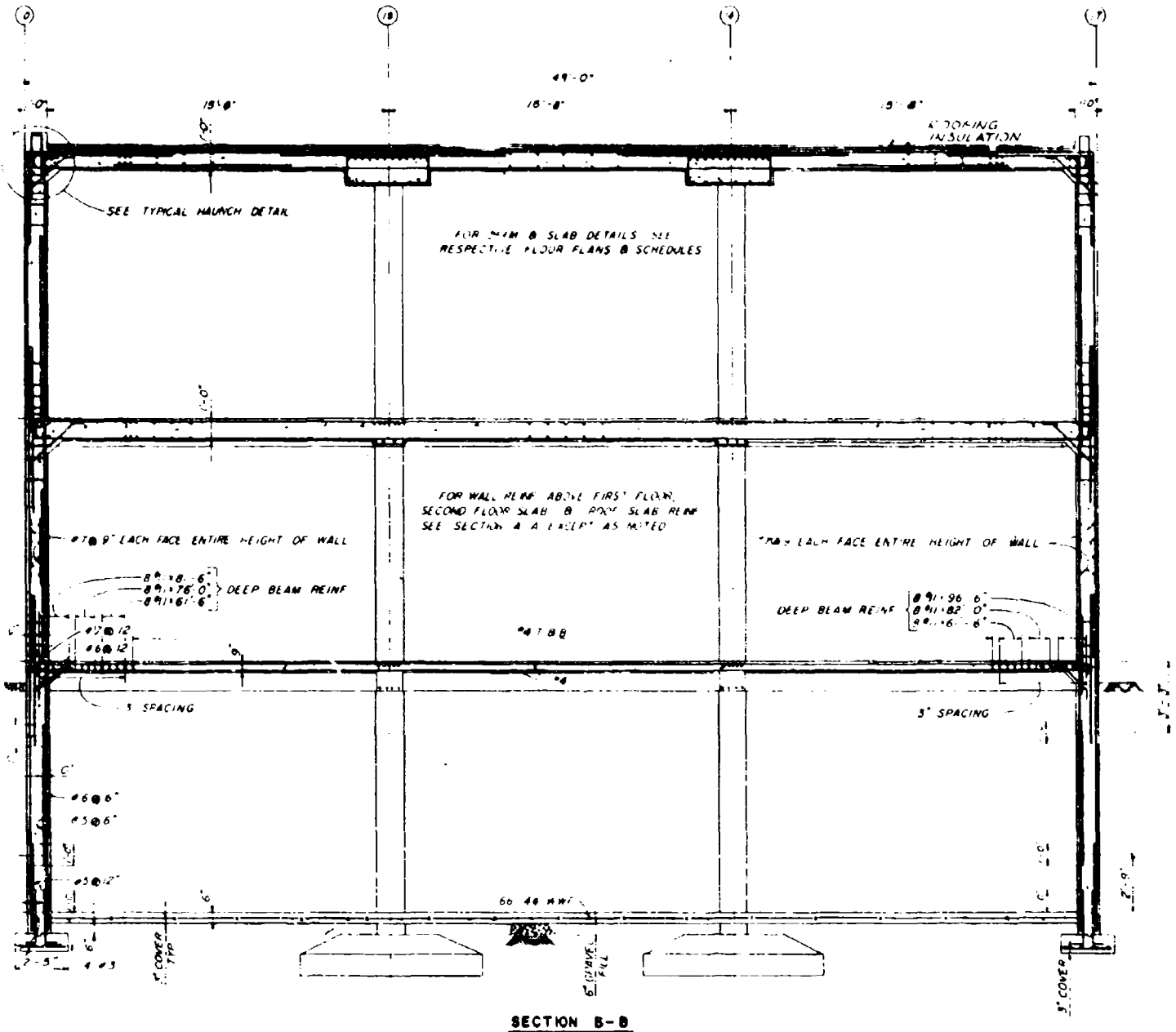
SCALE 1/8"=1'-0"



COLUMN & COLUMN FOOTING SCHEDULE						
MARK No.	3M, 4M, 8M	7M, 6M, 9M, 11M, 12M, 13M, 15M, 16M, 17M, 18M, 19M, 20M, 21M, 22M, 23M, 24M, 25M, 26M, 27M, 28M, 29M, 30M, 31M, 32M	15C, 15D, 15E, 16C, 16D, 16E, 16F, 16G	15J, 15K, 16J, 16K	15P, 16P	21M, 22M, 23M
ROOF						
SIZE VERT REINF	1'-6"×1'-6" @ 9"	1'-8"×1'-8" @ 9"	1'-8"×1'-8" @ 9"	1'-8"×1'-8" @ 9"	1'-8"×1'-8" @ 9"	
2ND FL.	—					
SIZE VERT REINF	1'-6"×1'-6" @ 10"	1'-8"×1'-8" @ 9"	1'-8"×1'-8" @ 9"	1'-8"×1'-8" @ 9"	1'-8"×1'-8" @ 9"	
1ST FL.	—	—				
SIZE VERT REINF	—	—	1'-8"×1'-8" @ 9"	1'-8"×1'-8" @ 9"	1'-8"×1'-8" @ 9"	1'-8"×1'-8" @ 9"
BASEMENT FL.	—		—		BOILER RM. FLOOR	
DOWELS	@ 10"	@ 9"	@ 9"	—	@ 9"	@ 9"
FOOTINGS A	9'-0"	7'-0"	8'-0"	COMBINED FOOTING	8'-0"	7'-0"
FOOTINGS B	8'-0"	6'-0"	8'-0"		6'-0"	6'-0"
FOOTINGS C	1'-11"	0'-11"	0'-11"		0'-11"	0'-11"
FOOTINGS D	1'-11"	0'-11"	1'-0"		1'-0"	0'-11"
FOOTINGS E	2'-6"	2'-6"	1'-0"		1'-0"	1'-0"
FOOTINGS F	8'-0"×8'-0"	1'-8"×1'-8"	1'-8"×1'-8"		1'-8"×1'-8"	1'-8"×1'-8"
REINF EACH WAY	33-#8	31-#8	33-#8		33-#8	21-#8



TYPICAL COLUMN FOOTING



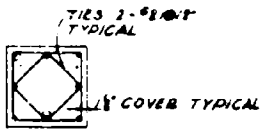
SECTION B-B

SCALE: 1/4"=1'-0"

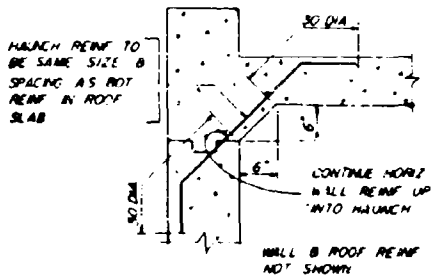
NOTE

CONCRETE COVER TO REINFORCING BARS IS AS FOLLOWS EXCEPT AS NOTED

BEAMS	1½"
FLOOR SLABS	¾"
EXTERIOR WALLS	2" DURING POUR ¾" FINISH POUR
INTERIOR WALLS	¾"



SECTION b-b

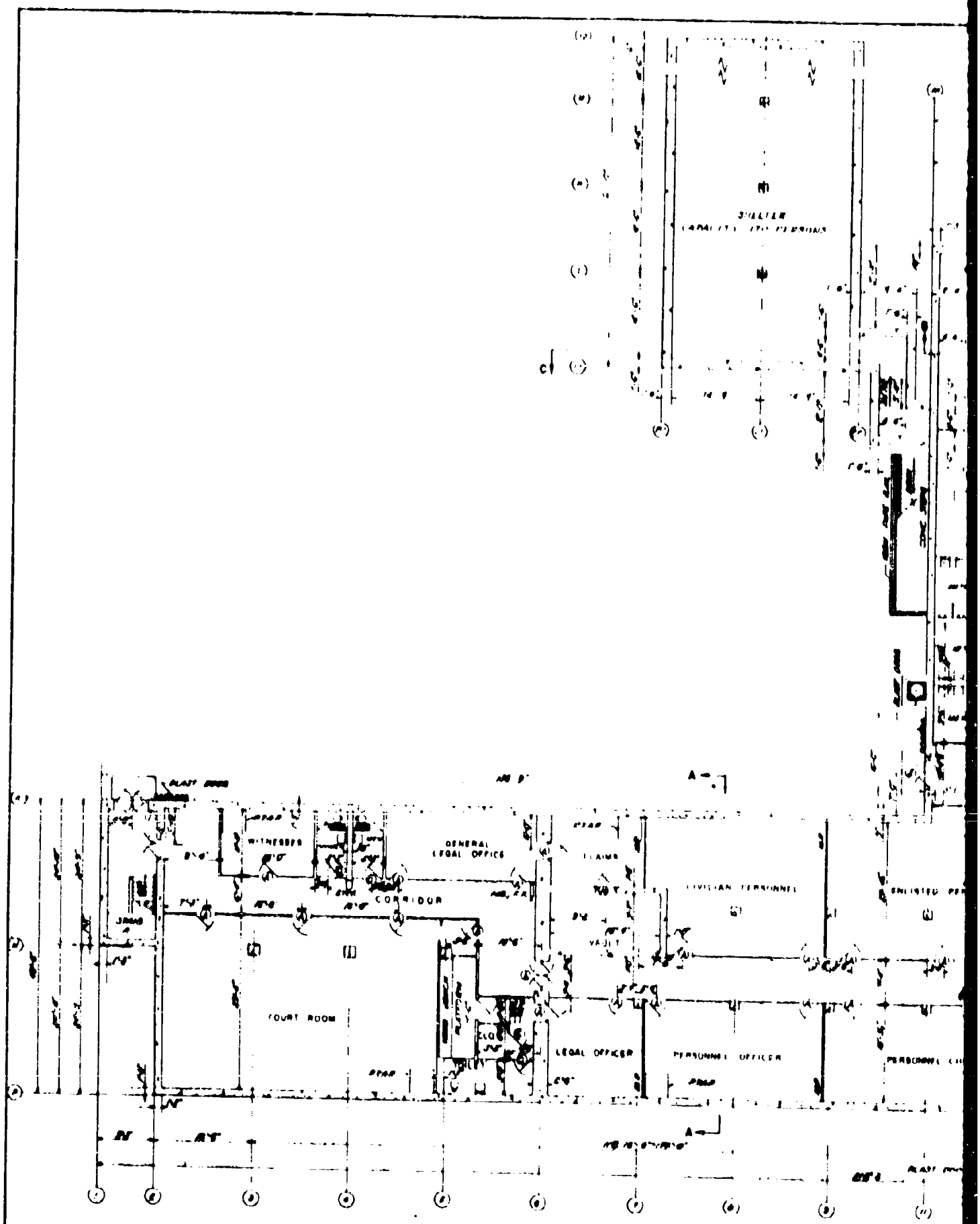


TYPICAL HAUNCH DETAIL

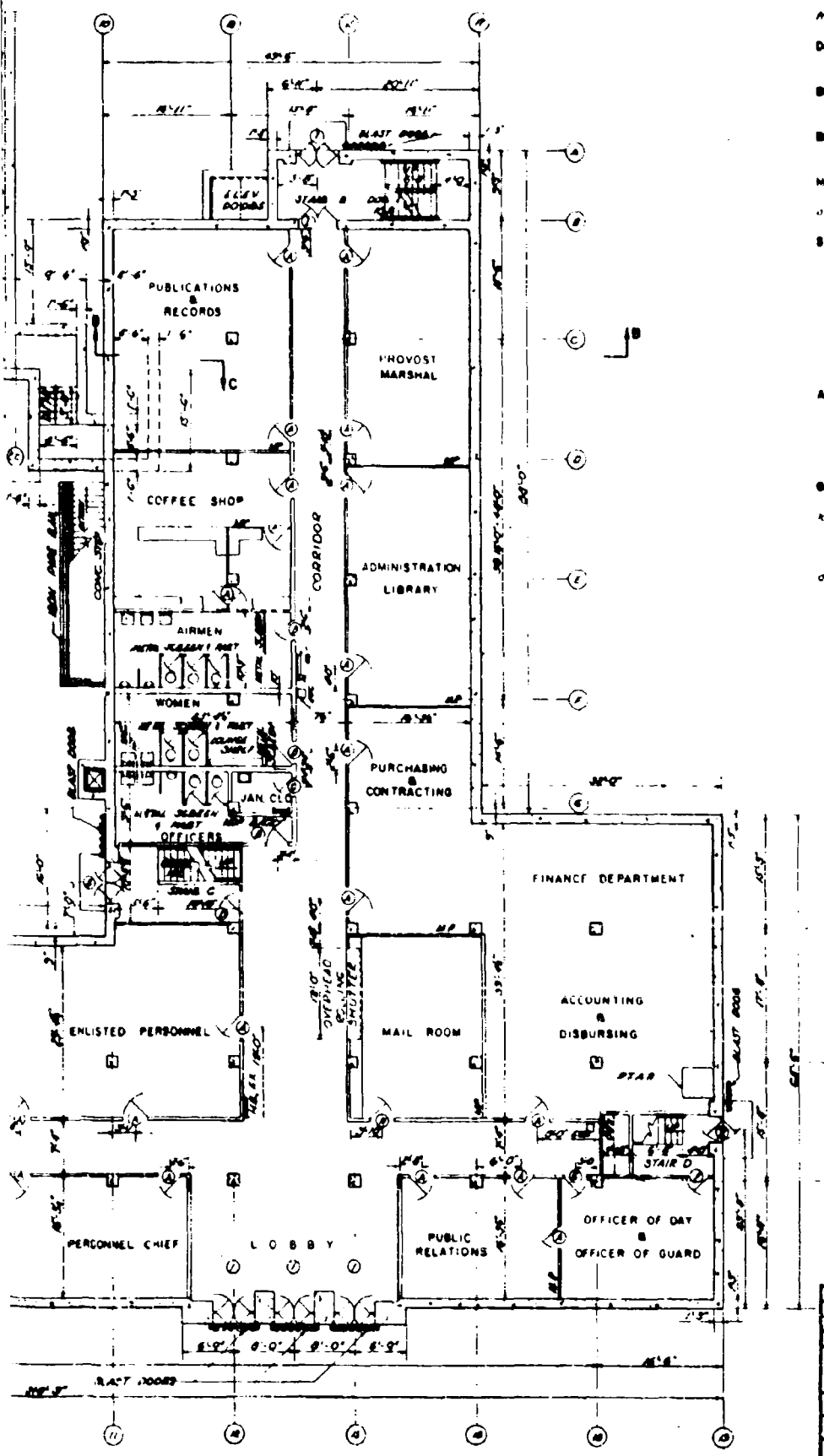
SCALE: 1"=1'-0"

AMMANN & WHITNEY CONSULTING ENGINEERS 111 5TH AVENUE, NEW YORK, N.Y.	DEPARTMENT OF THE ARMY OFFICE OF THE CHIEF OF ENGINEERS MILITARY CONSTRUCTION ENGINEERING DIVISION WASHINGTON, D.C.
DESIGNED BY D.H. J.S. DRAWN BY G.P.	PROTECTIVE CONSTRUCTION ADMINISTRATION BUILDING 20 PSI BLAST RESISTANT
SCALE: AS NOTED	DRAWING NUMBER 60-16-01
DATE: 6-4-1958	SHEET 9 OF 9

2



FIRST FLOOR AND SHELTER PLAN



ER PLAN

DESIGN CONDITIONS

Design Procedure

In accordance with OCE manual, "Design of Structures for Protection from the Effects of Atomic Weapons"

Design Blast Wave

Peak incident pressure = 30psi. Duration = 1.05 sec

Blast Loading on Roof

Peak pressure = 30psi. Duration = 1.05 sec

Blast Loading on Walls

Peak pressure = 100psi. Duration = 1.05 sec.

Nuclear Radiation Protection for Shelter Area

Total gamma and neutron attenuated to 5% for a 20KT weapon at any position which will produce a peak blast pressure equal to 30psi.

Strength of Materials

	Static	Blast Design
Soil bearing capacity	8,000psf *	16,000psf *
Concrete, f'c	4,000psi	5,800psi
Reinf. steel, lower yield (Int Grade, ASTM A305 30T)	47,000psi	52,000psi
Structural steel, lower yield (ASTM A7 30)	38,000psi	41,600psi

* rated capacity of soil

Allowable Stresses and Deflections

Roof, walls, columns and footings designed for plastic deformation under design blast load. Blast doors designed for maximum elastic deformation under design blast load.

General Notes

1. The following features are not shown and shall be determined to suit use requirements:

   Mechanical and electrical equipment

   Air locks and decontamination facilities

2. This design study is based upon Dept of the Air Force definitive Drawing No 30 OE 08, Westover AFB Drawing No 30-02-02

ABBREVIATIONS

CLO	CLOSET
CONC	CONCRETE
ELEV	ELEVATOR
EWC	ELECTRIC WATER COOLER
FIN	FINISHED
FX	FIRE EXTINGUISHER
HR	HOSE RACK
MP	MOVABLE PARTITION
PART	PARTITION
PTAP	PIPE TRENCH ACCESS PANEL
R	RISERS

MATERIAL LEGEND

CONCRETE

WOOD STUD PARTITION

MOVABLE PARTITION

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111-8TH AVENUE, NEW YORK, N. Y.

DEPARTMENT OF THE ARMY
OFFICE OF THE CHIEF OF ENGINEERS
MILITARY CONSTRUCTION DIVISION
WASHINGTON, D.C.

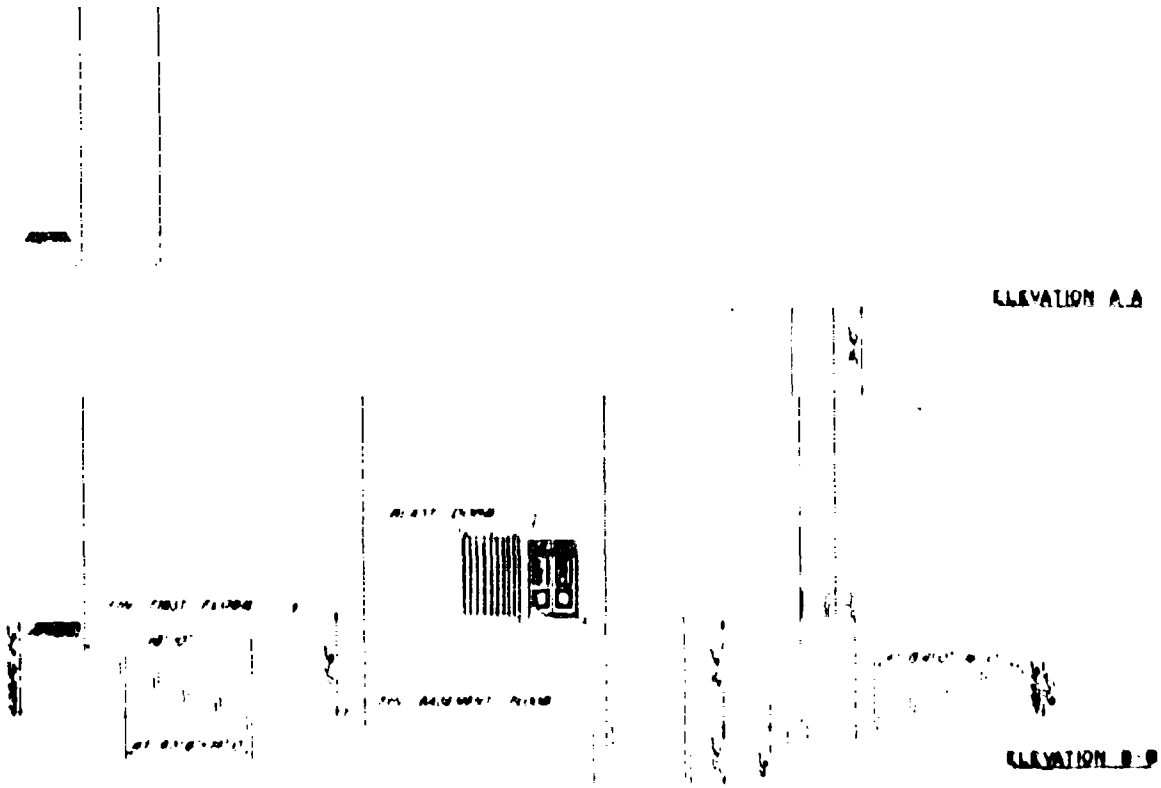
F.W.
G.P.

PROTECTIVE CONSTRUCTION ADMINISTRATION BUILDING 30 PSI BLAST RESISTANT

1"=1'-0"

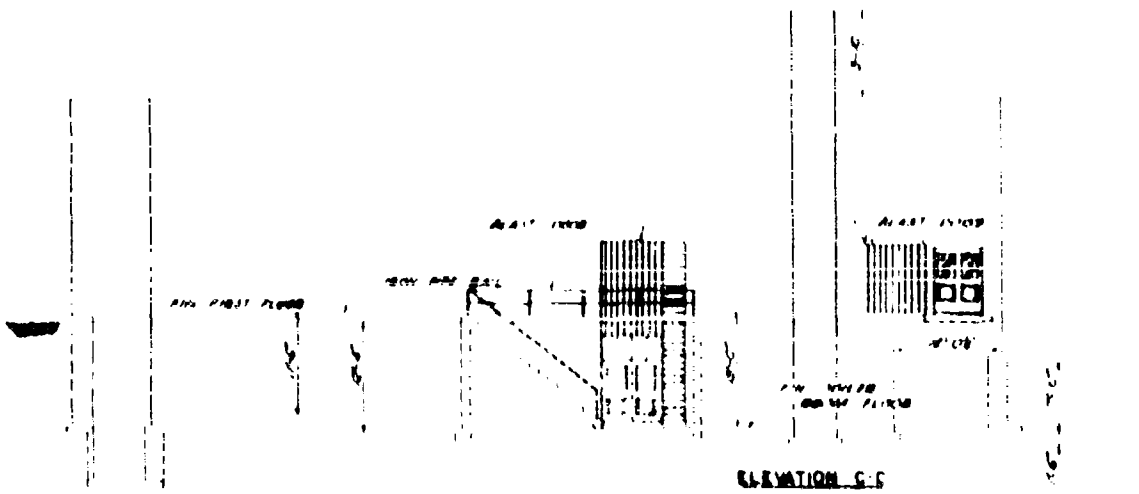
DRAWING NUMBER
60-15-01
SHEET 1 OF 3

2



ELEVATION A-A

ELEVATION B-B



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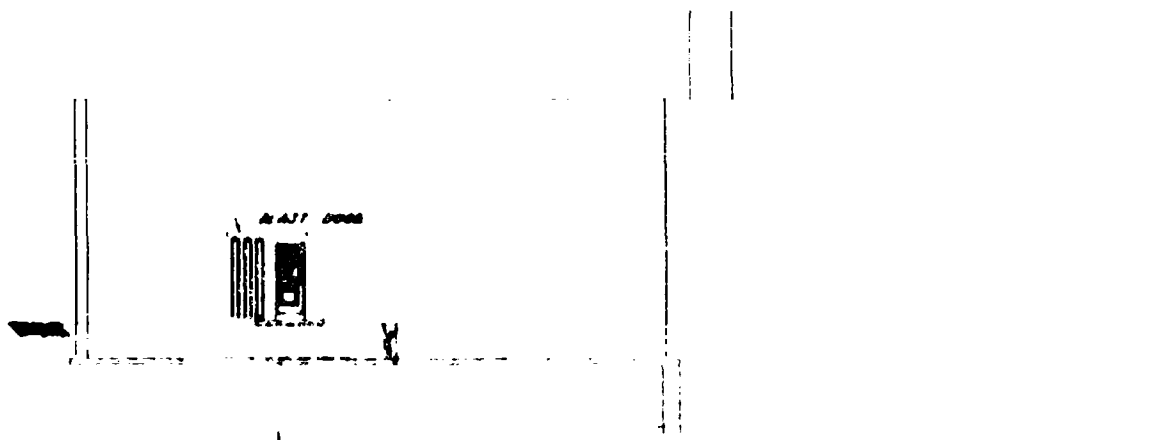
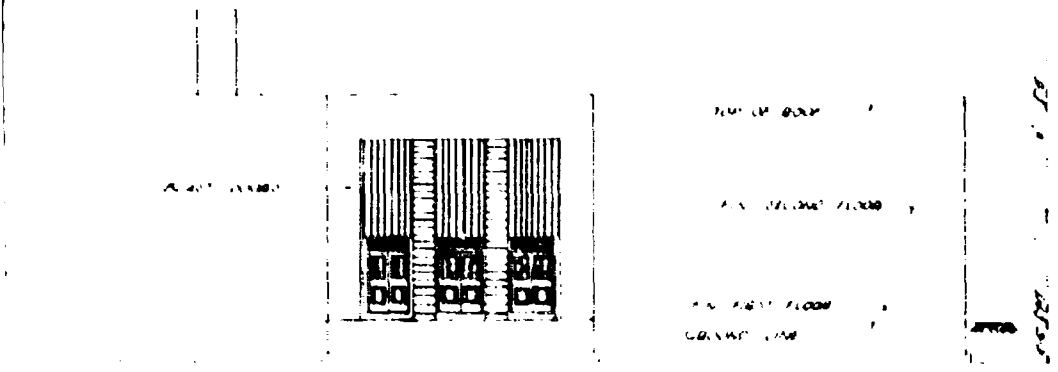
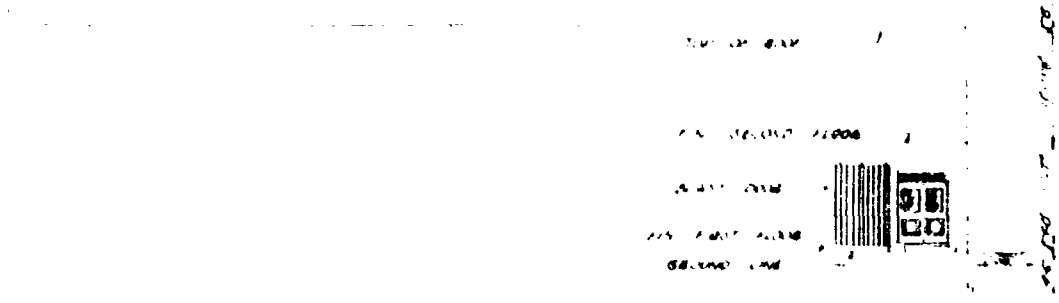


ELEVATION D-D



ION A-A



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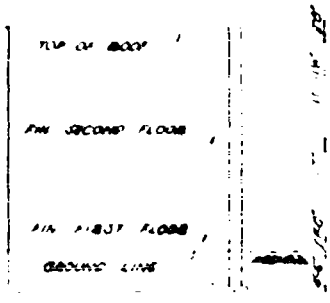

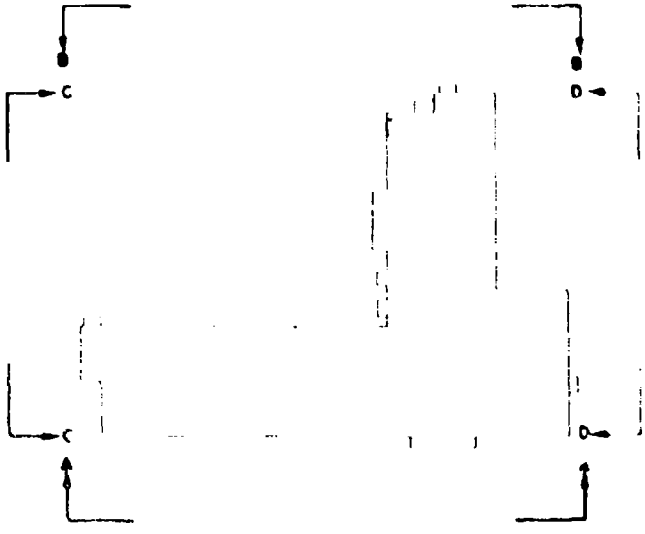

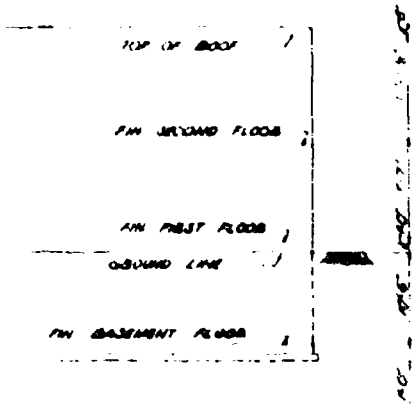

2

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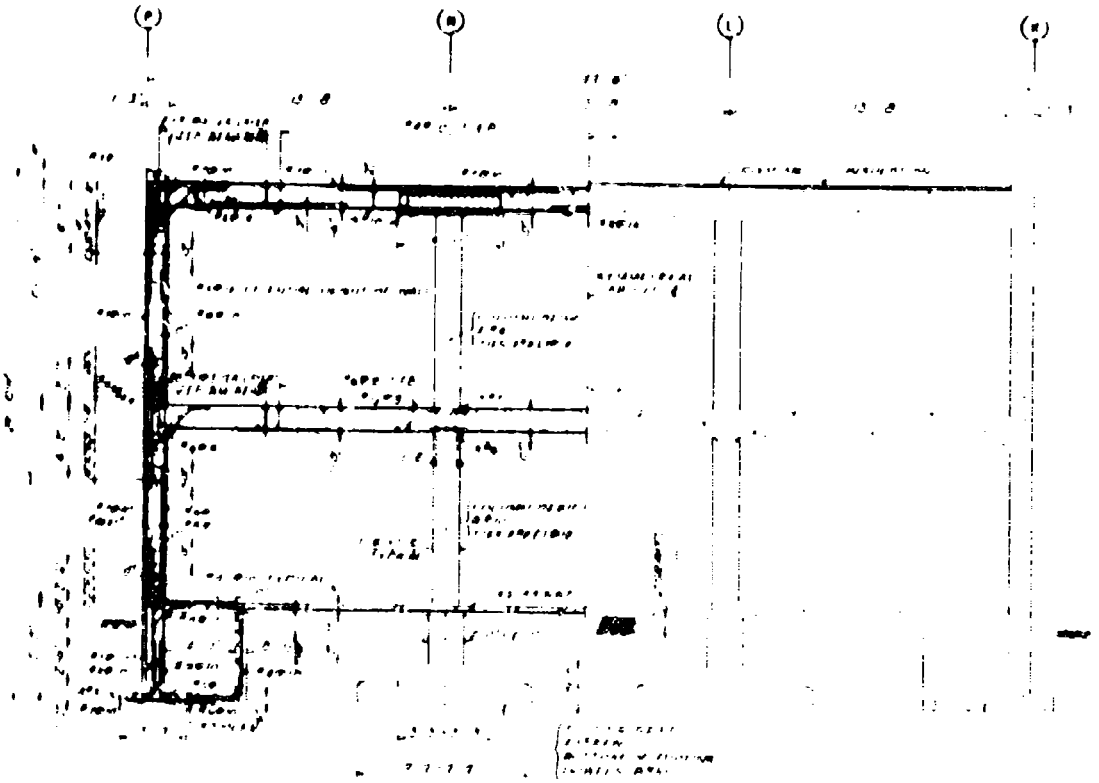
PROTECTIVE CONSTRUCTION
ADMINISTRATION BUILDING
30 PSI BLAST RESISTANT

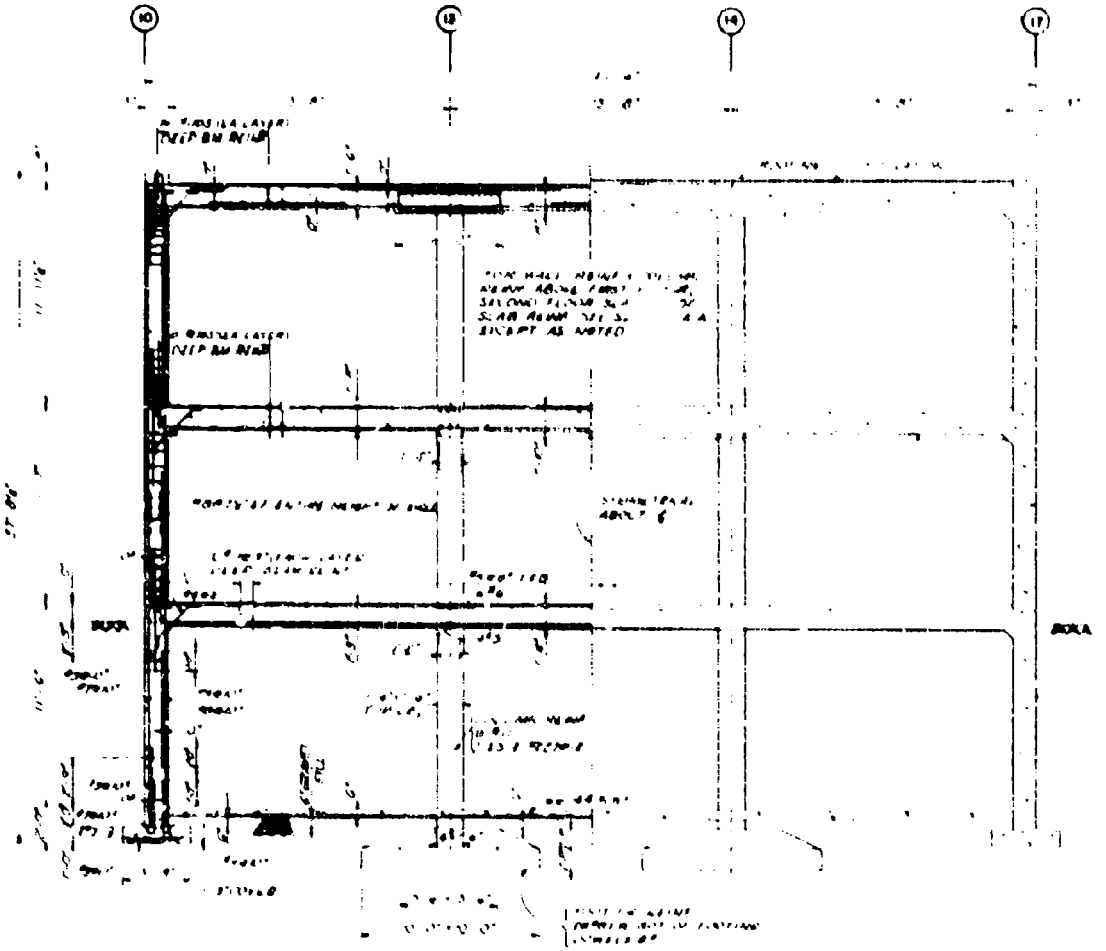
60-16-01

SHEET 2 OF 3



SECTION A-A

SECTION C-C



SECTION B-B

NOTE:
CONCRETE COVER TO REINFORCING BARS IS AS FOLLOWS EXCEPT AS NOTED

BEAMS	2"
FLOOR SLABS	1"
EXTERIOR WALLS	2" outside face 1" inside face
INTERIOR WALLS	1"

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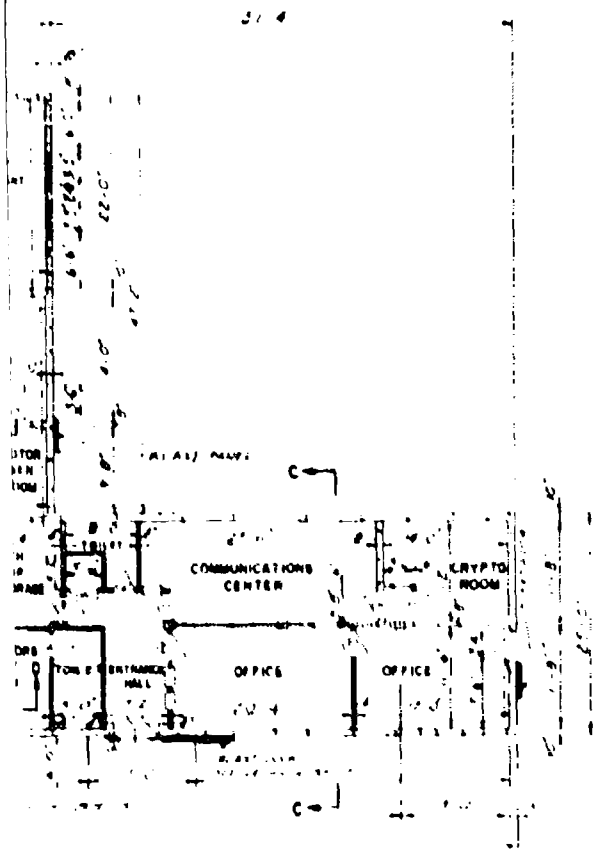
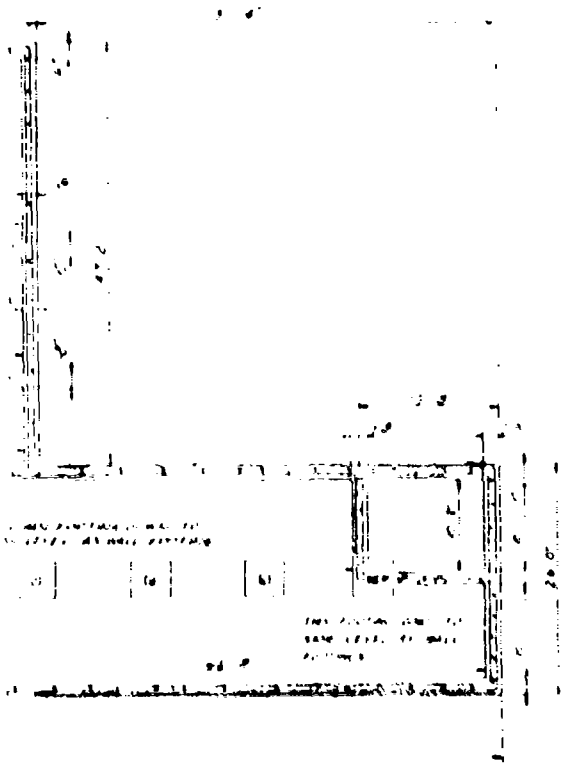
DESIGNED BY F.W.	PROTECTIVE CONSTRUCTION ADMINISTRATION BUILDING 30 PSI BLAST RESISTANT		
DRAWN BY J.P.			
SCALE 1/4"=1'-0"		DRAWING NUMBER 60-16-01	
		SHEET 3 OF 3	

2

FLOOR PLAN

FOUNDATION PLAN





DESIGN CONDITIONS

Design Procedure

Design Blast Wave

Blast Loading on Roof

Blast Loading on Walls

Nuclear Radiation Protection for Shelter Area

Strength of Materials

	Stalls	Steel Design

Allowable Stresses and Deflections

General Notes

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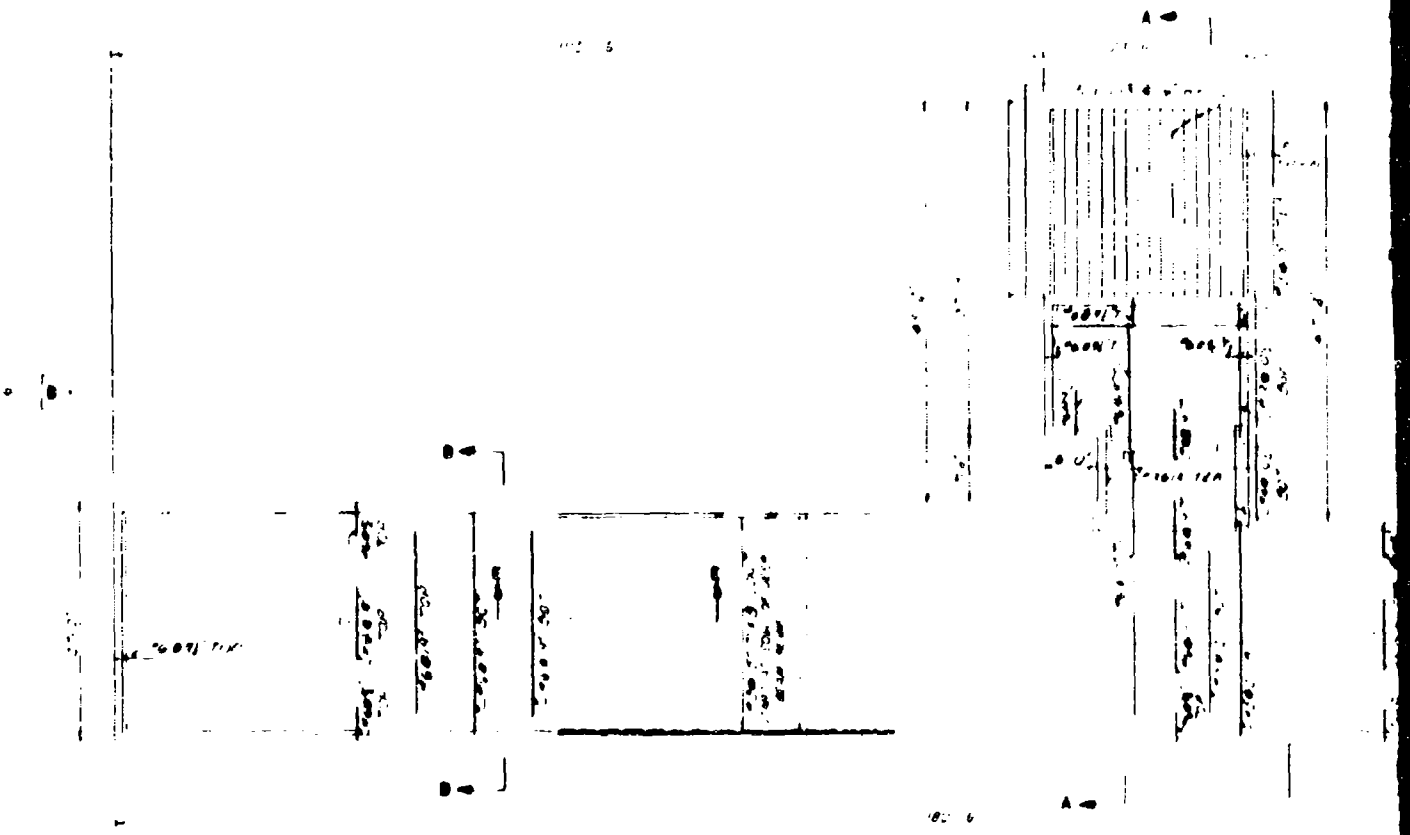
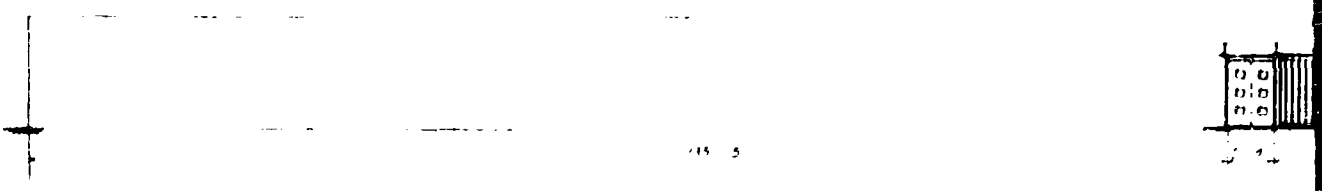
DEPARTMENT OF THE ARMY

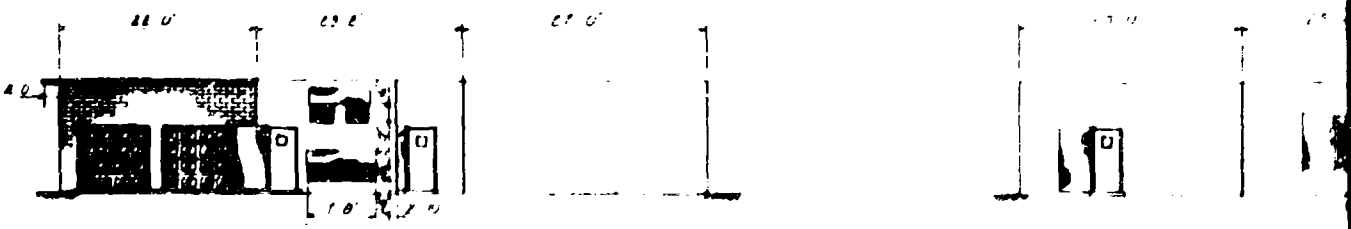
PROTECTIVE CONSTRUCTION
COMMUNICATIONS BUILDING
10 PSI BLAST RESISTANT



ROOF PLAN
SCALE 1/8" = 1'-0"

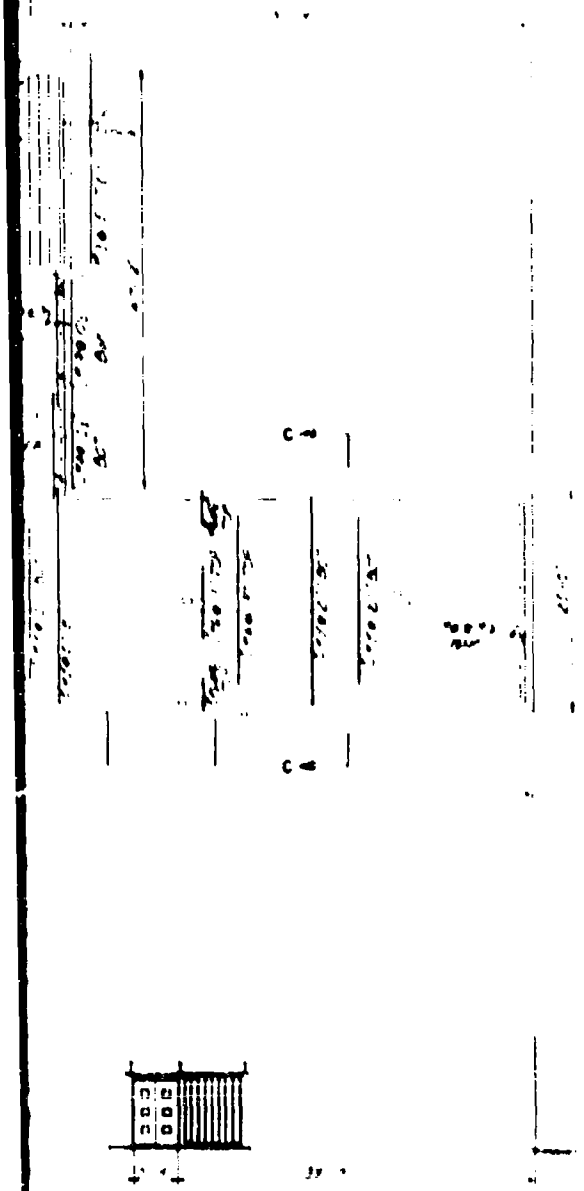


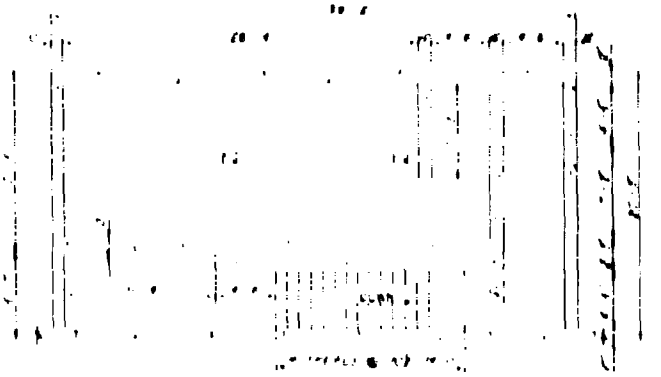
ELEVATION A
SCALE 1/8" = 1'-0"



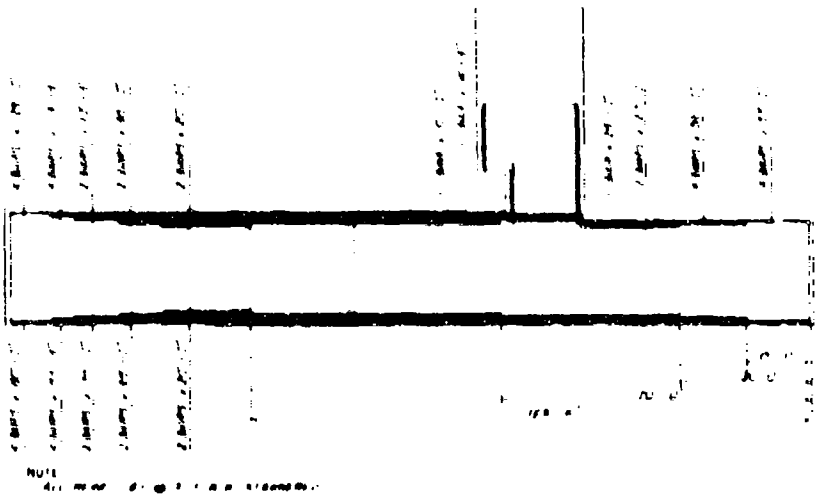
ELEVATION B
SCALE 1/8" = 1'-0"

ELEVAT
SCALE





PLAN OF SHELTER



ROOF SLAB

DECK BEAM REINFORCEMENT

ELEVATION C

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PROTECTIVE CONSTRUCTION
COMMUNICATIONS BUILDING
10 PSI BLAST RESISTANT

60-09-08

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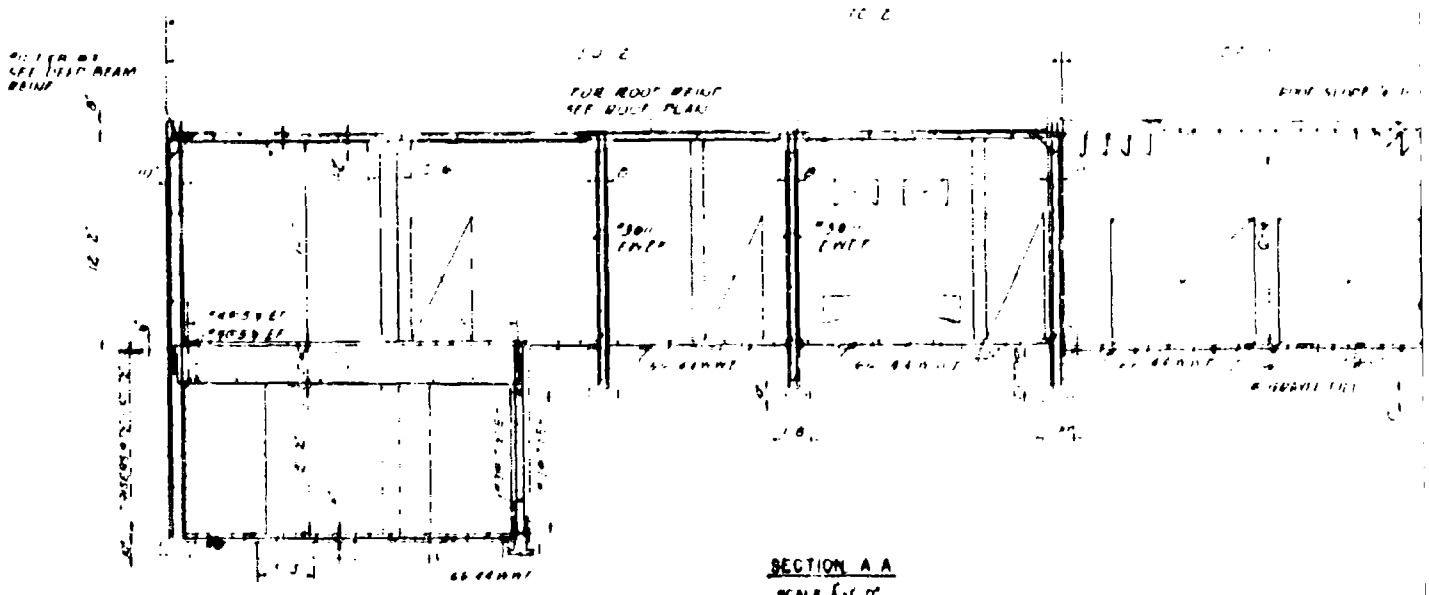
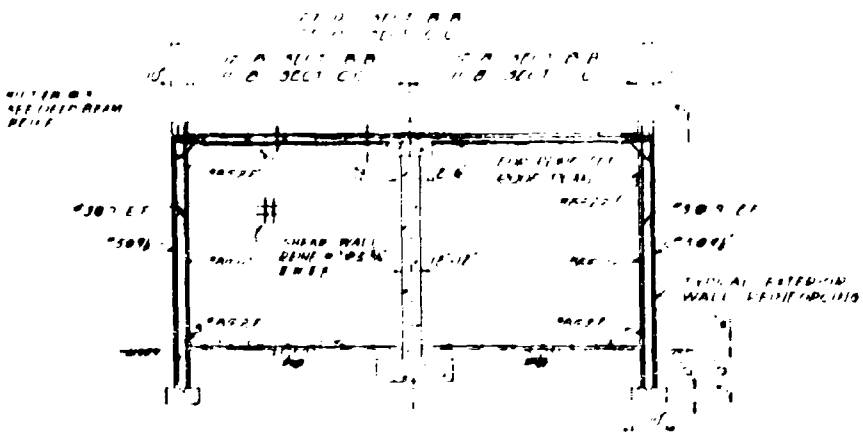
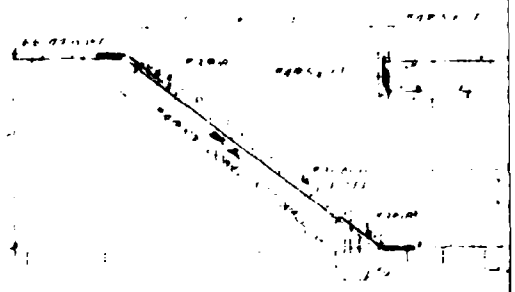


SECTION A A
SCALE 1/4" = 1' 0"



SECTION B-B & C-C
SCALE 1/4" = 1'-0"



SECTION D D
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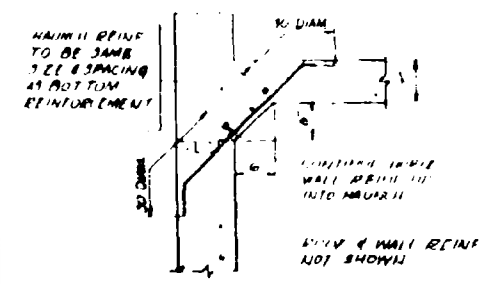
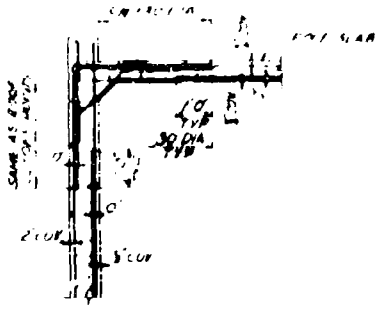
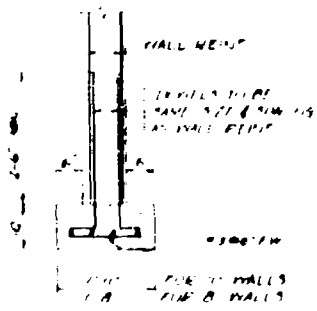


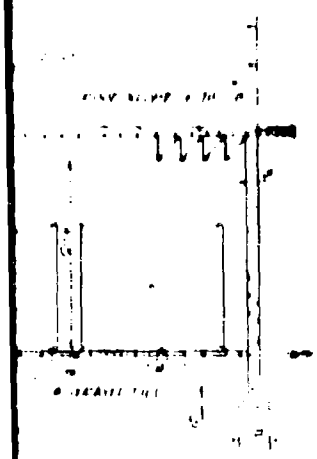
TYPICAL HAUNCH DETAIL
SCALE 1" = 1'-0"



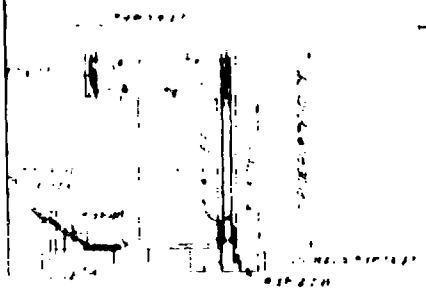
TYPICAL CORNER DETAIL
SCALE 1/4" = 1'-0"

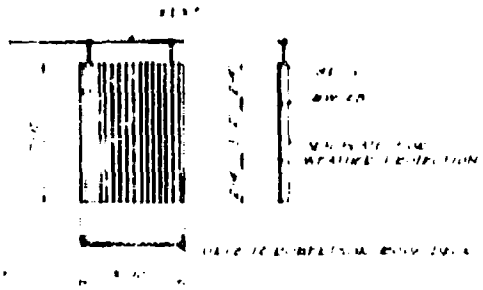


TYPICAL WALL FOOTING
SCALE 1/4" = 1' 0"

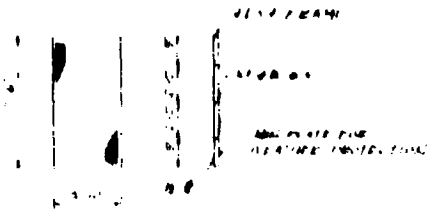


SECTION A A





DETAIL B
TYPICAL



DETAIL B
TYPICAL

NOTES

DOOR SCHEDULE

PLAN SYMBOL	SIZE	MATERIAL
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NOTING

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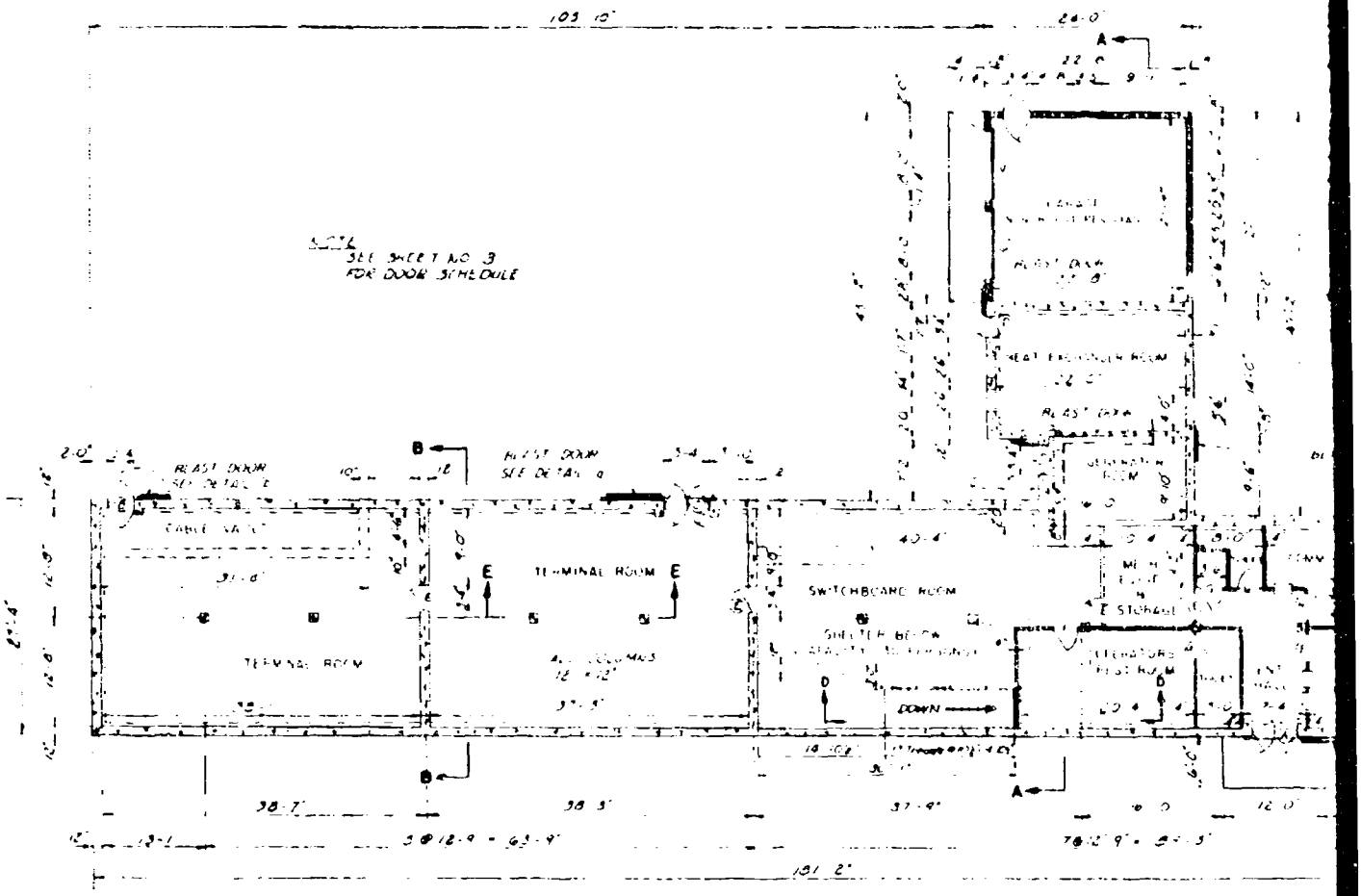
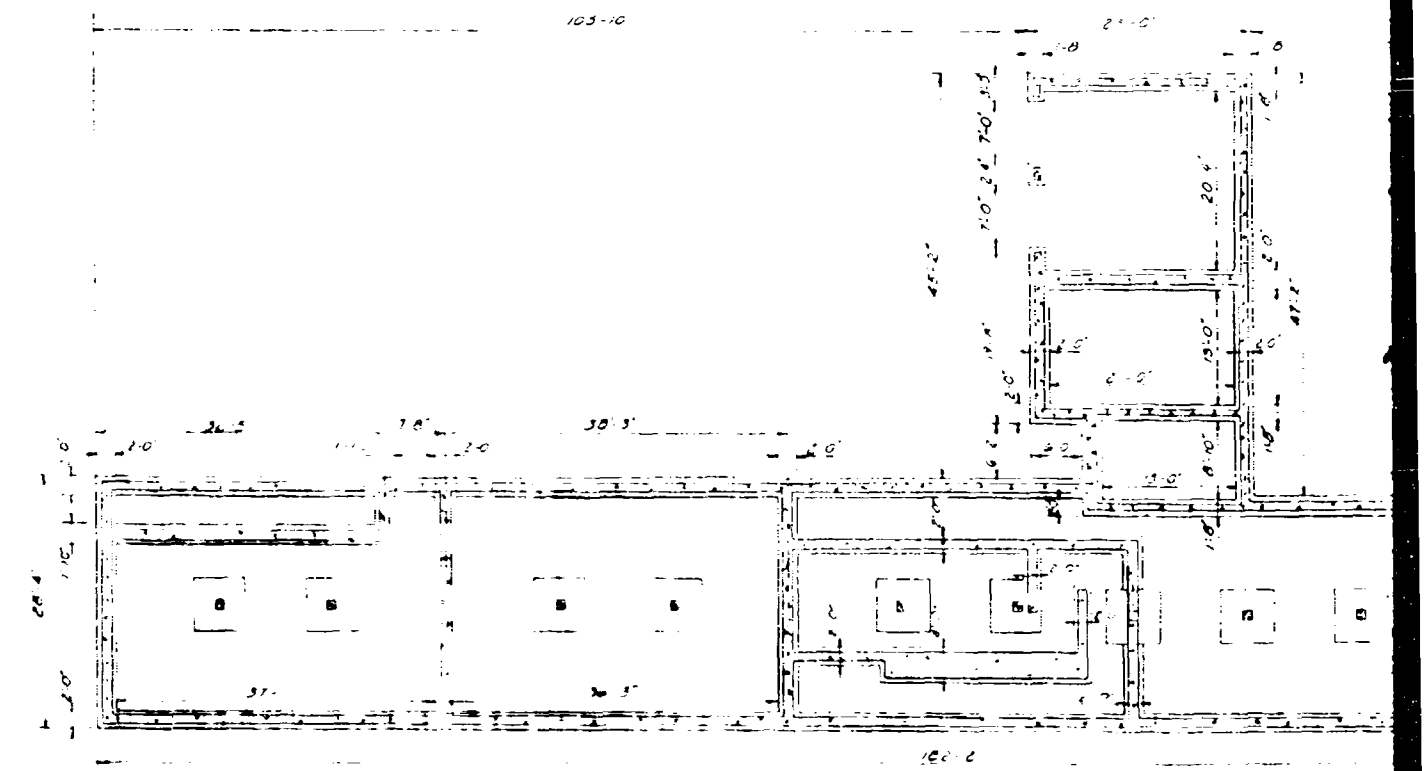
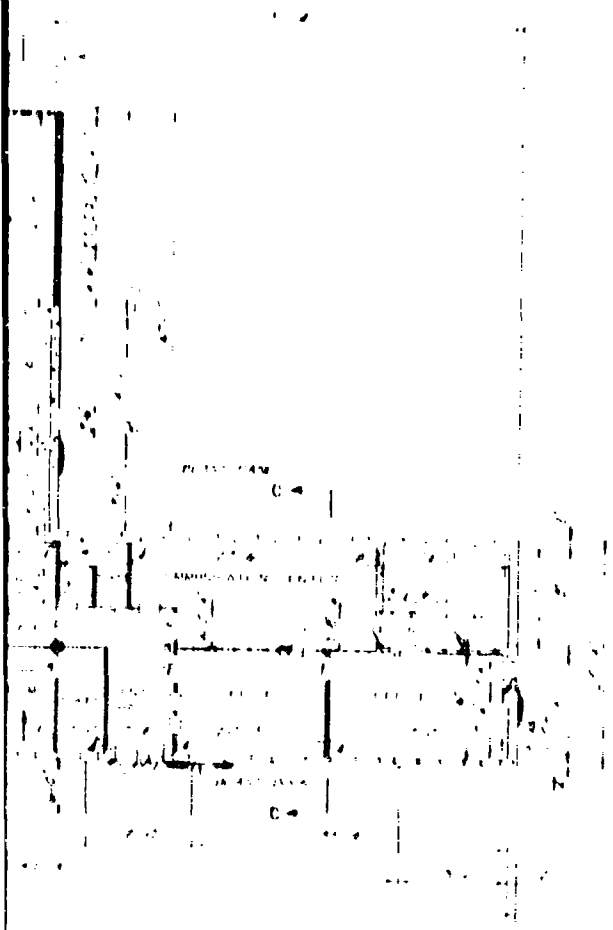
PROTECTIVE CONSTRUCTION
COMMUNICATIONS BUILDING
10 PSI BLAST RESISTANT

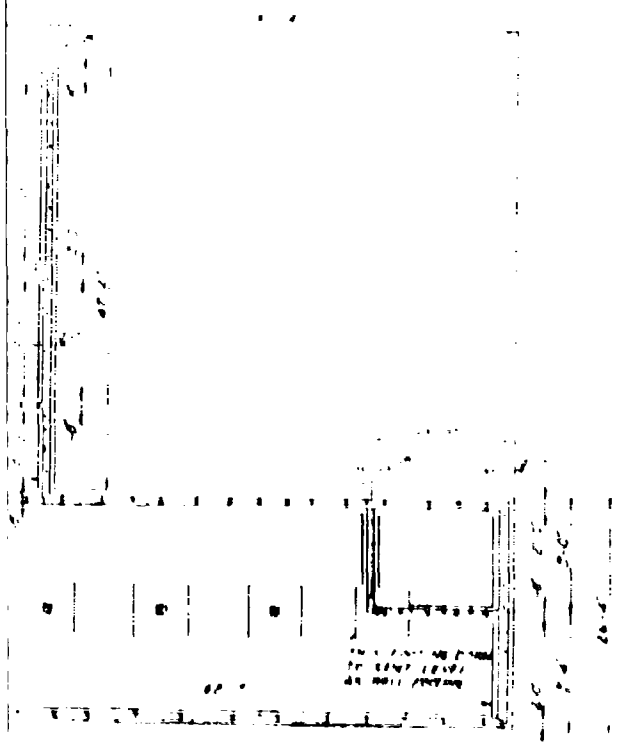


FLOOR PLAN



FOUNDATION PLAN





DESIGN CONDITIONS

Design Pressure

Blast Wave

Blast Loading on Roof

Blast Loading on Walls

Nuclear Radiation Protection for Shelter Area

Strength of Materials

	Static	Blast Design

Allowable Stresses and Deflections

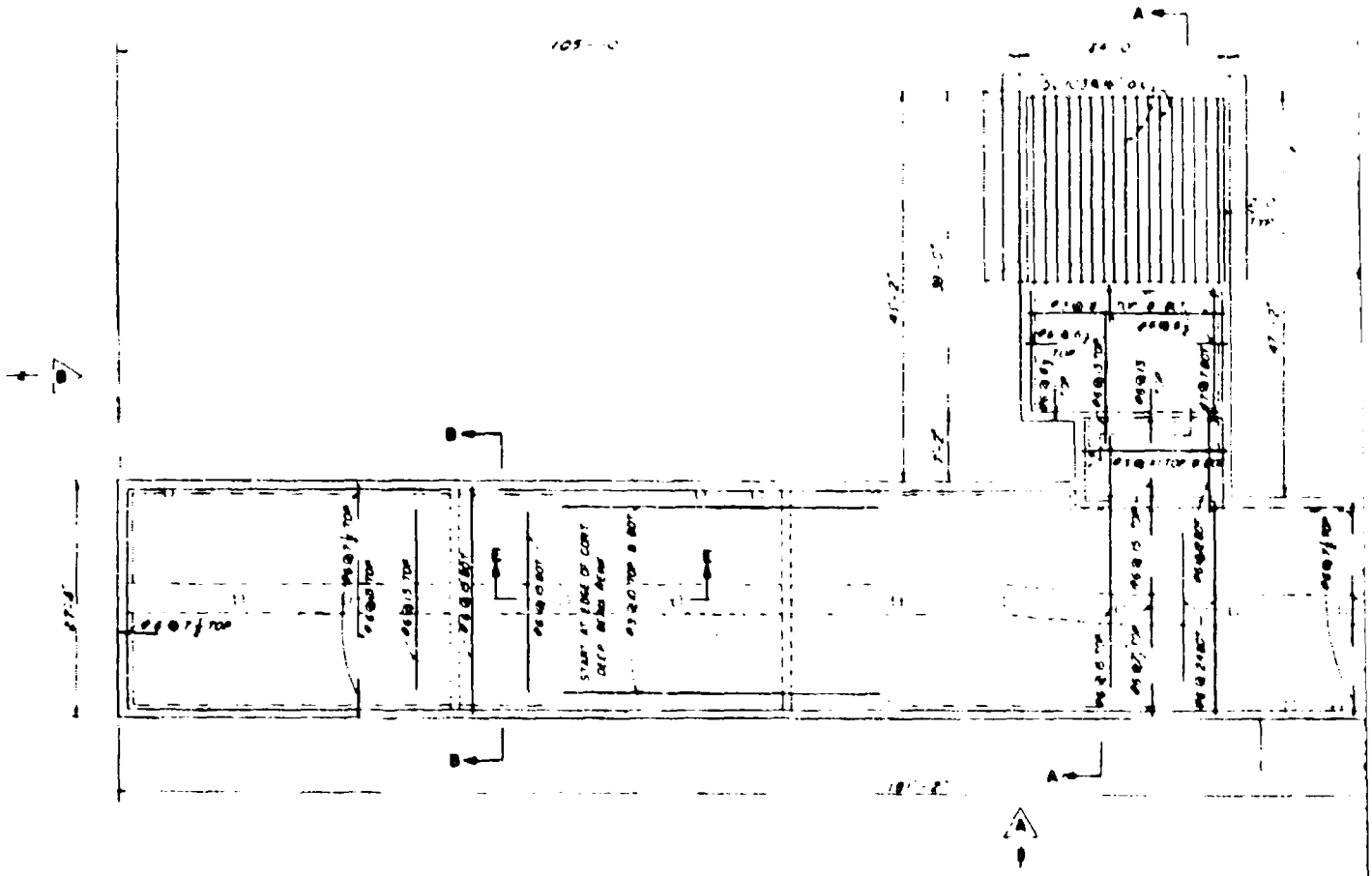
General Notes

AMMANN & WHITNEY

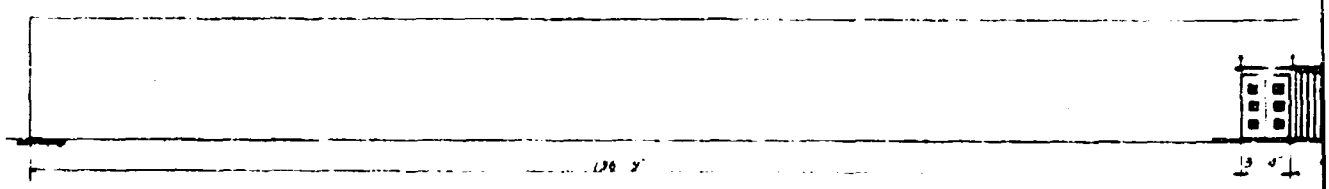
DEPARTMENT OF THE ARMY

PROTECTIVE CONSTRUCTION
COMMUNICATIONS BUILDING
23 PSI BLAST RESISTANT

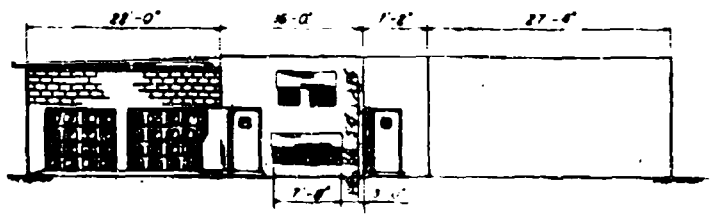
3



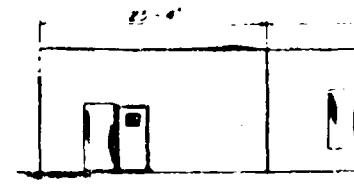
ROOF PLAN



ELEVATION A



ELEVATION B



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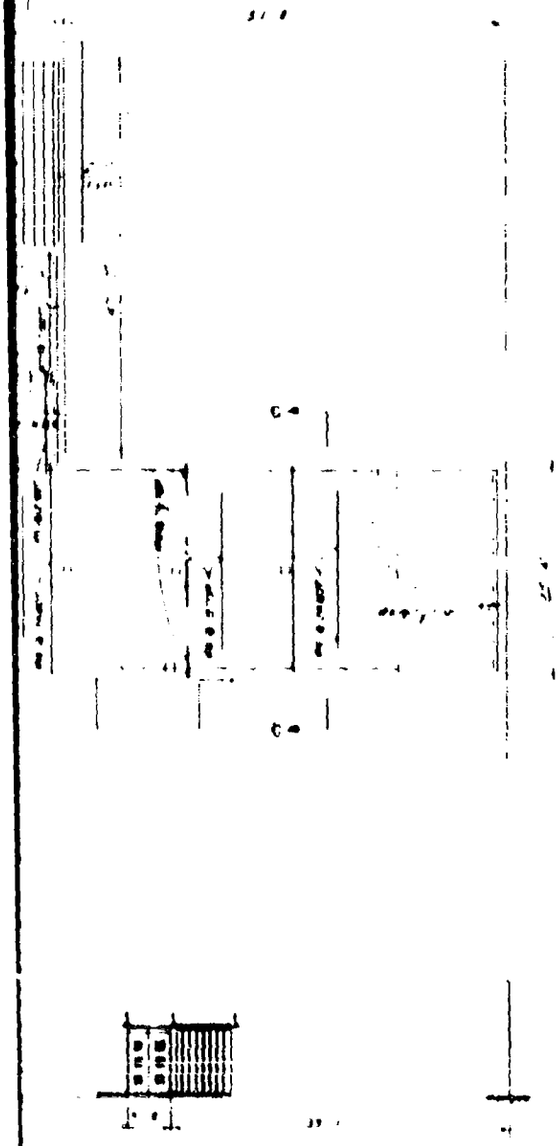
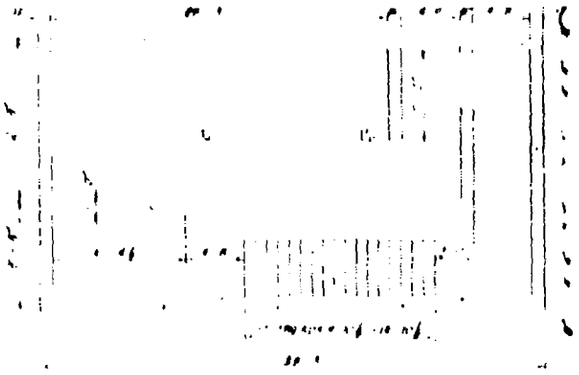
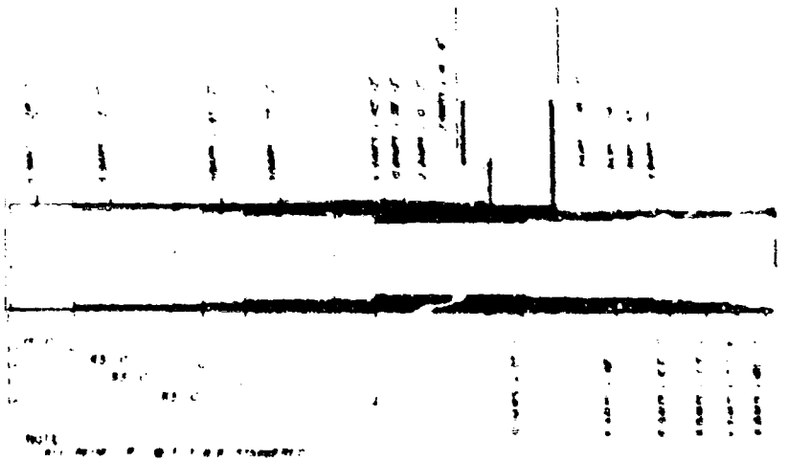
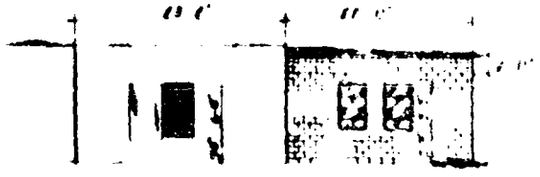




PLAN OF SHELTER



DEEP BEAM REINFORCEMENT



ELEVATION D

ASMANN & WHITNEY

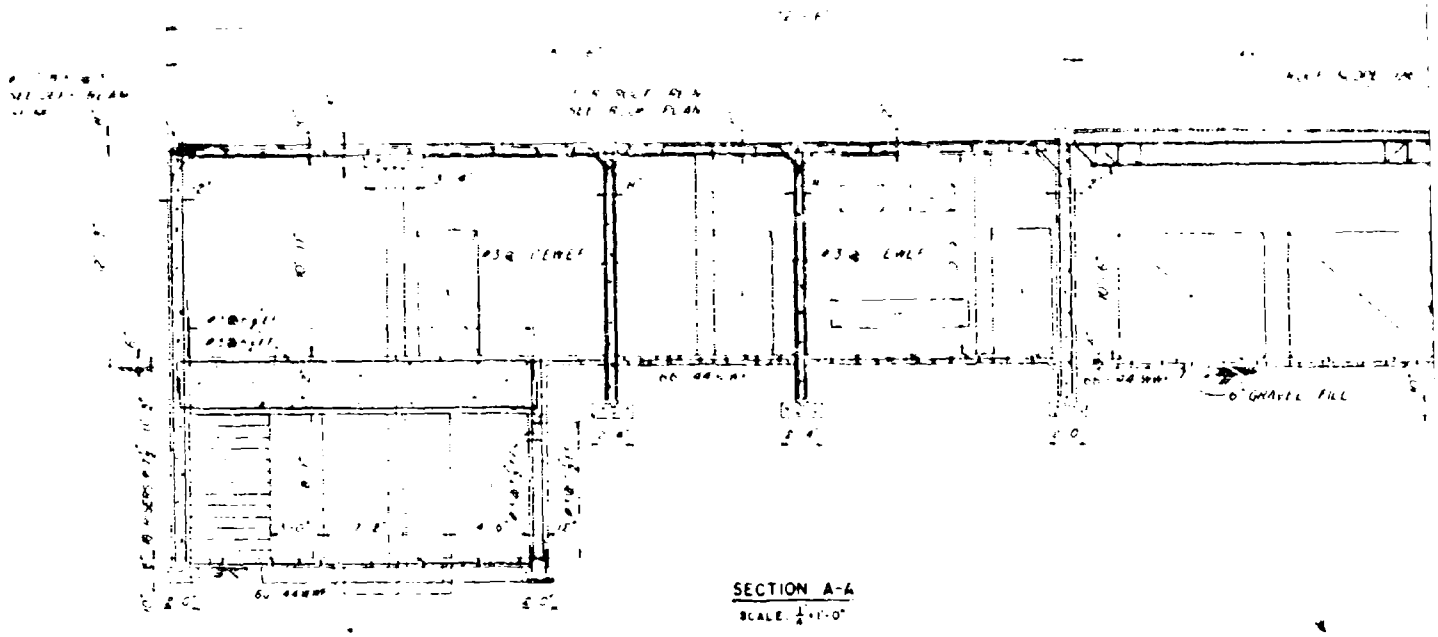
DEPARTMENT OF THE

PROTECTIVE CONSTRUCTI

COMMUNICATIONS BUILDIN

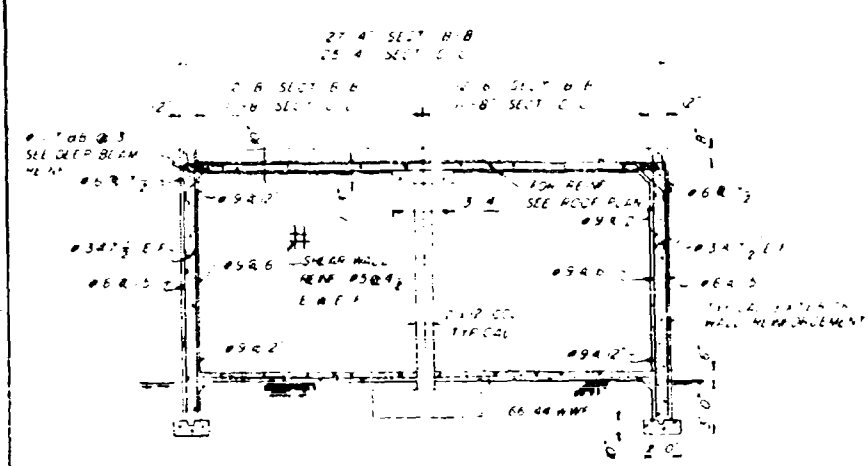
50 PSI BLAST RESISTANT

3



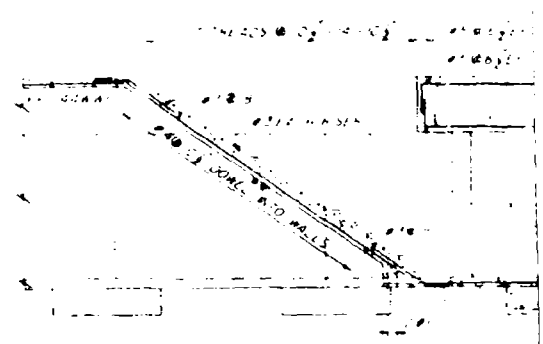
SECTION A-A

SCALE: 1/4"=1'-0"



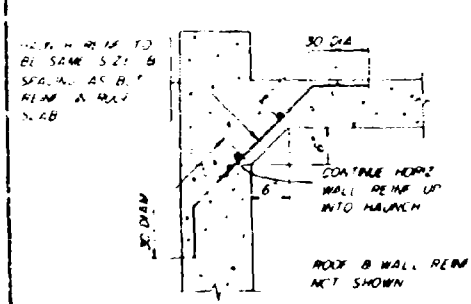
SECTION B-B & C-C

SCALE: 1/4"=1'-0"



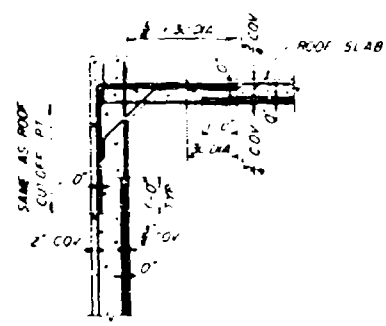
SECTION D-D

SCALE: 1/4"=1'-0"



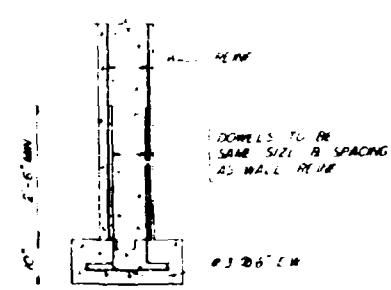
TYPICAL HAUNCH DETAIL

SCALE: 1/2"=1'-0"



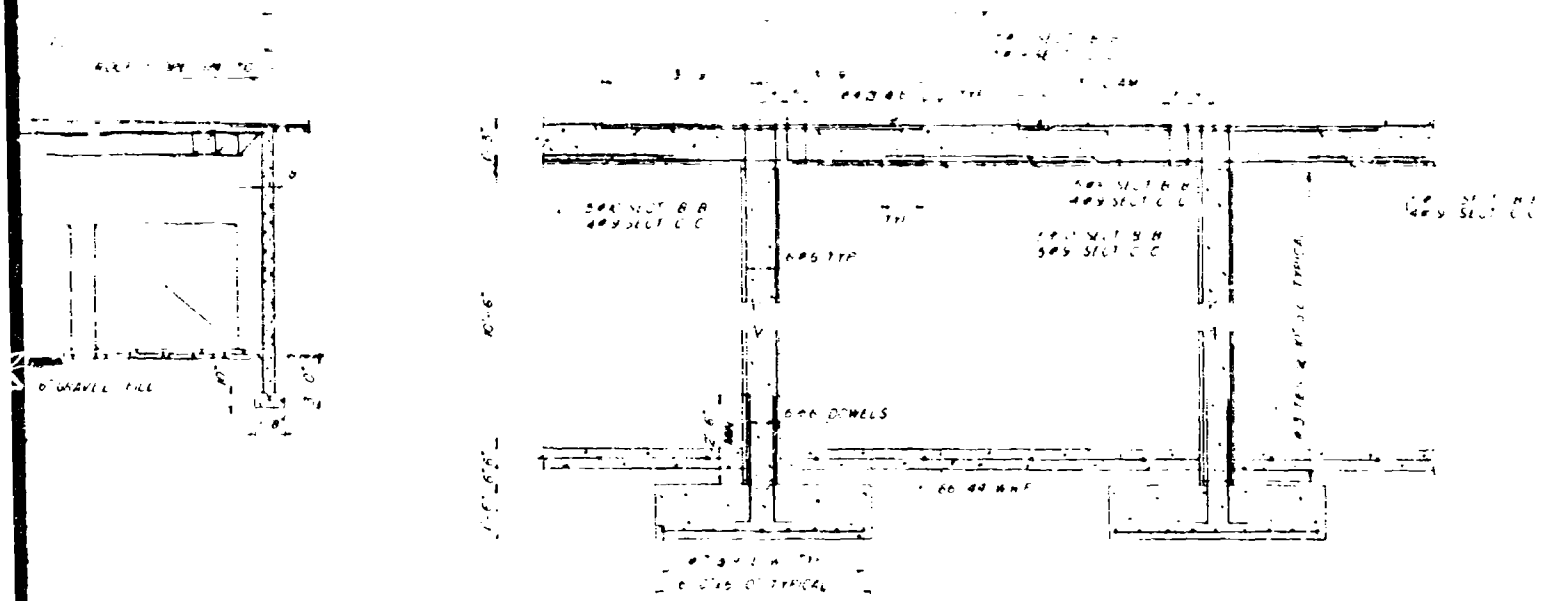
TYPICAL CORNER DETAIL

SCALE: 1/4"=1'-0"



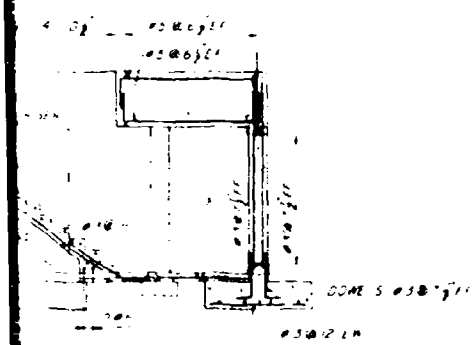
TYPICAL WALL FOOTING

SCALE: 1/4"=1'-0"



SECTION E-E

SCALE 1/4" = 1'-0"



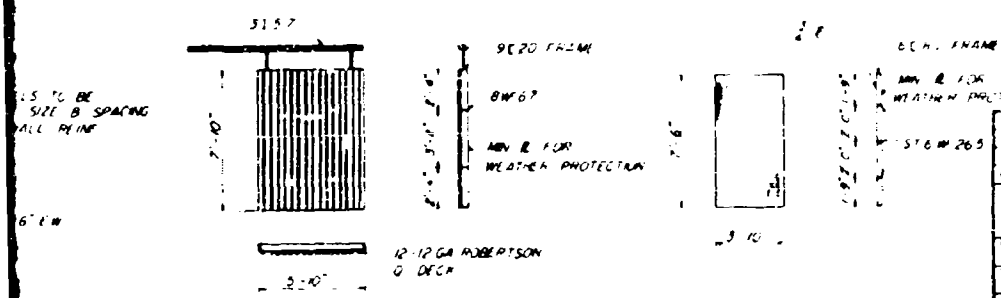
N D-D

1'-0"

DOOR SCHEDULE		
PLAN SYMBOL	SIZE	MATERIAL
A	2'-2"x6'-7"x1 3/4"	W.P. SOLID CORE
B	3'-0"x7'-0"	DO
	2'-0"x6'-7"x1 3/4"	DO
D	3'-0"x7'-0"	DO
E	3'-0"x6'-8"	ARCH HOLLOW CORE
F	2'-6"x6'-8"	DO
G	2'-6"x6'-0"	DO
H	3'-0"x6'-8"	HOLLOW METAL
J	6'-0"x7'-0"	WOOD
K	3'-0"x6'-8"	HOLLOW METAL
	2'-6"x6'-8"	DO

NOTES

1. FOR BEAMS FOR SLABS ALL REINF SPLICES TO BE [illegible] OF 3 [illegible] AT 1/4 PT OF SPAN
2. FOR BEAMS MAX ALLOWABLE STIRRUPS TO BE 1/3 PERCENT



TING

DETAIL a
TYPICAL
SCALE 1/4" = 1'-0"

DETAIL b
TYPICAL
SCALE 1/4" = 1'-0"

REVISIONS	DATE	DESCRIPTION	BY	APPROVED

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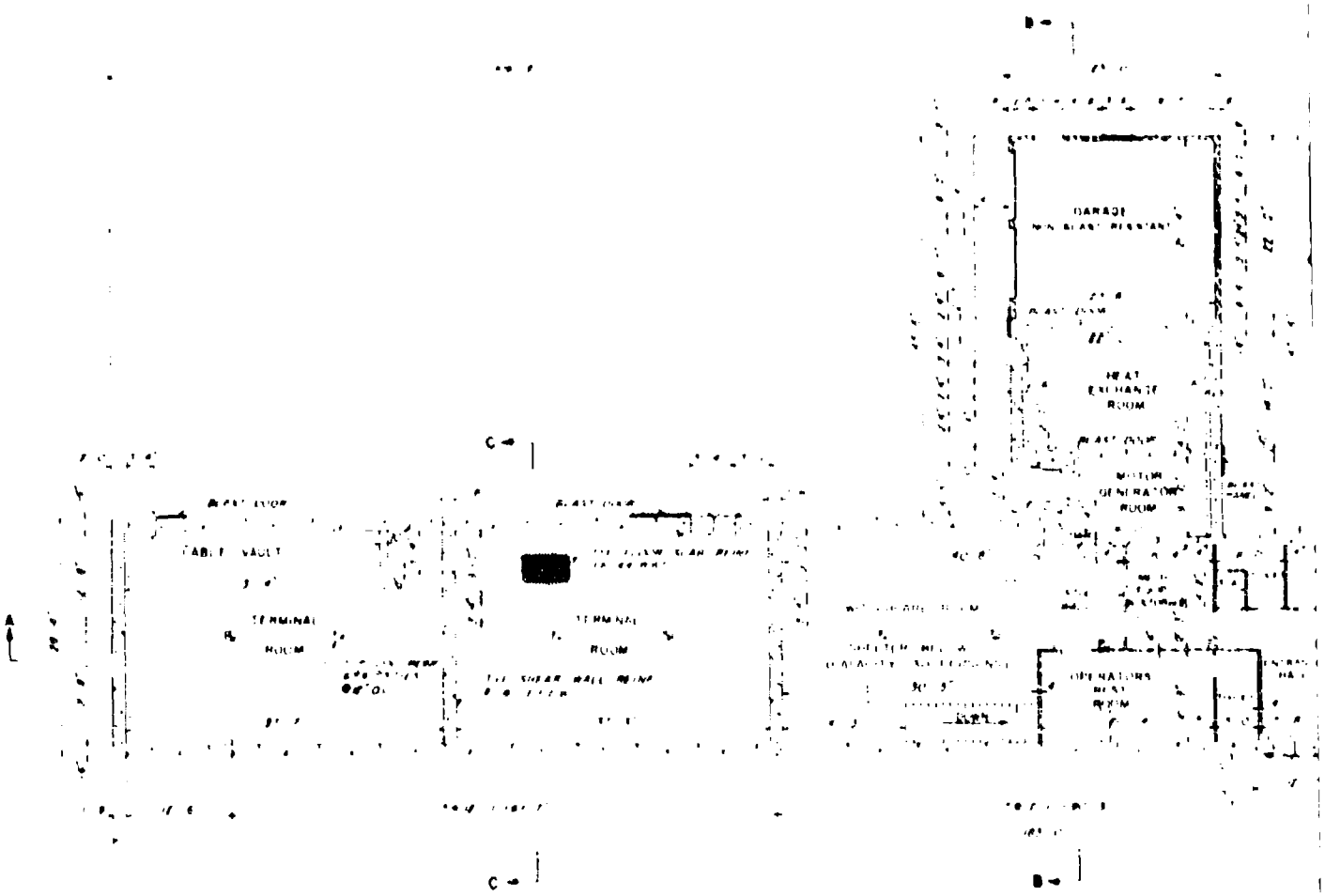
CONSULTING ENGINEERS
111 8TH AVENUE, NEW YORK, N.Y.

DEPARTMENT OF THE ARMY
OFFICE OF THE CHIEF OF ENGINEERS
MILITARY CONSTRUCTION ENGINEERING DIVISION
WASHINGTON, D.C.

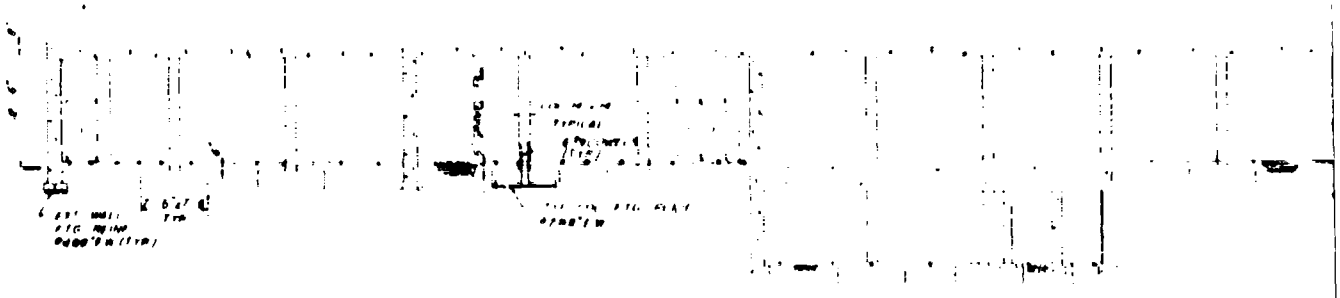
DESIGNED BY J.S.
DRAWN BY
CHECKED BY J.E.
APPROVED

PROTECTIVE CONSTRUCTION
COMMUNICATIONS BUILDING
20 PSI BLAST RESISTANT

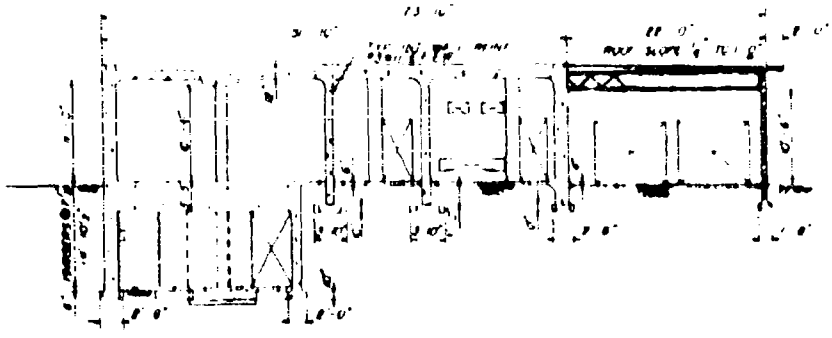
SCALE AS NOTED
DRAWING NUMBER 60-02-55
SHEET 3 OF 3



FLOOR PLAN



SECTION A-A



SECTION B-B

Design Procedure

Design Blast Wave

Blast Loading on Roof

Blast Loading on Walls

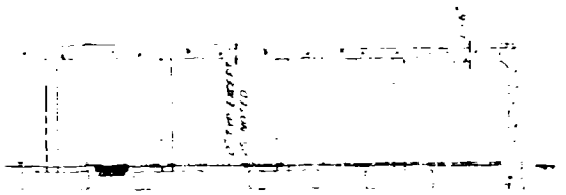
Nuclear Radiation Protection for Shelter Area

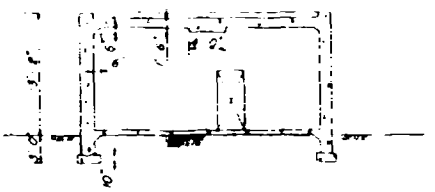
Strength of Materials

	Static	Blast Design

Allowable Stresses and Deflections

General Notes





SECTION C-C

LEGEND

CONCRETE BLOCK	EARTH
	GLASS

2

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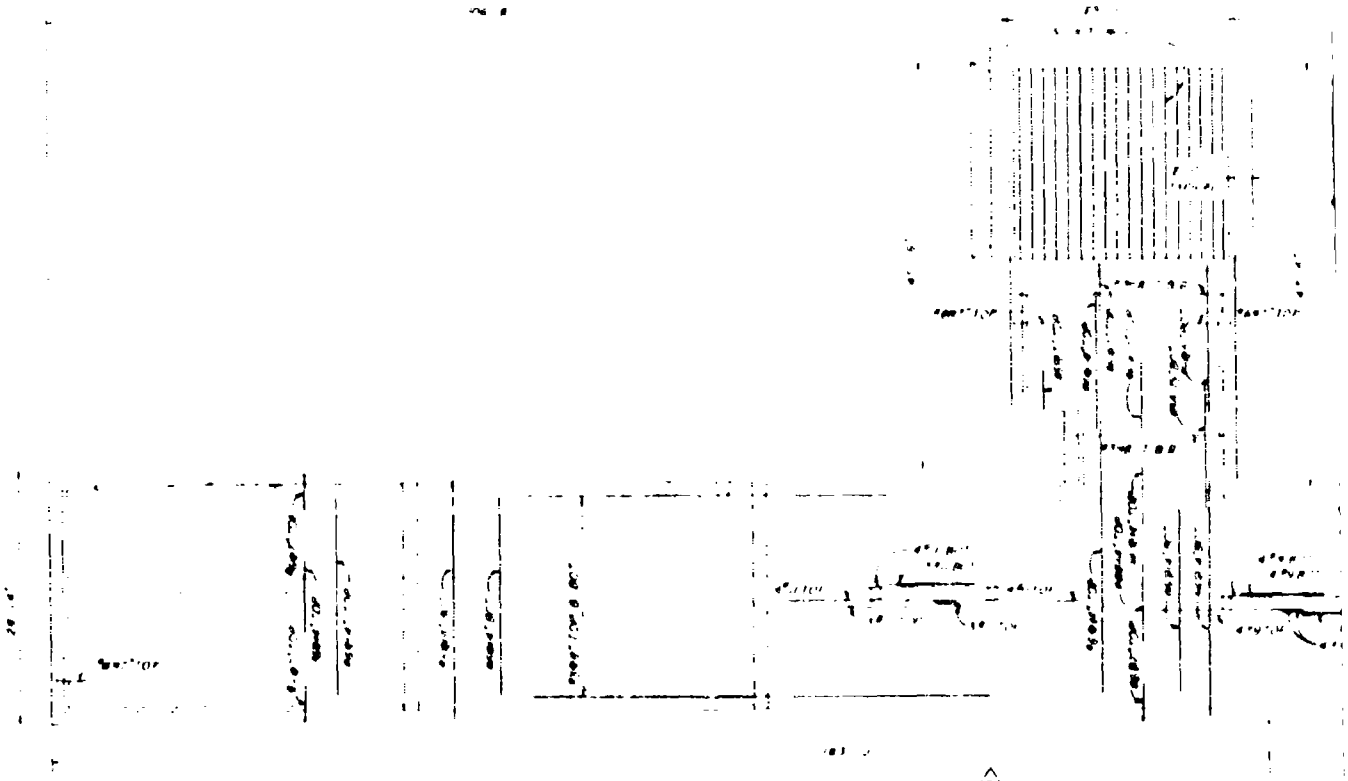
WASHINGTON, D.C.

DRAWN BY J.S.
TRACED BY
DESIGNED BY J.F.
CHECKED
APPROVED

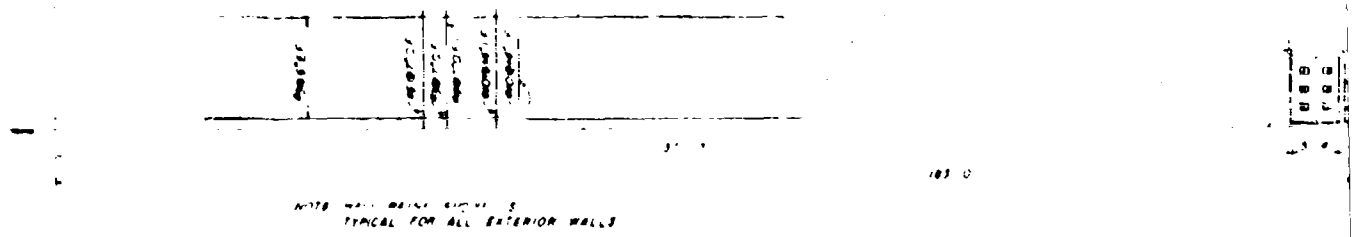
PROTECTIVE CONSTRUCTION
COMMUNICATIONS BUILDING
30 PSI BLAST RESISTANT

SCALE 1/8"=1'-0"
DRAWING NUMBER 60-02-56
SHEET 1 OF 2



ROOF PLAN

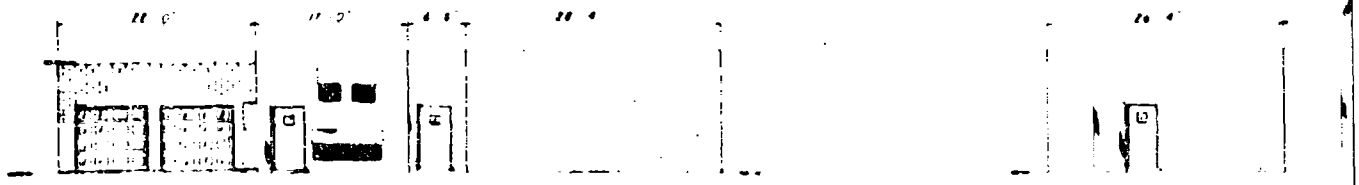
SCALE 1/8" = 1'-0"



NOTE: WALL BASIC SIDING IS TYPICAL FOR ALL EXTERIOR WALLS

ELEVATION A

SCALE 1/8" = 1'-0"

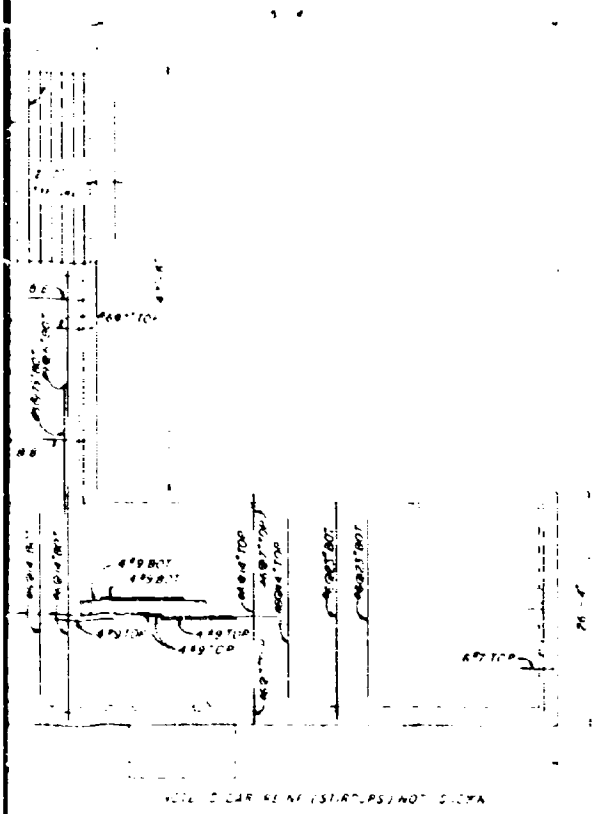


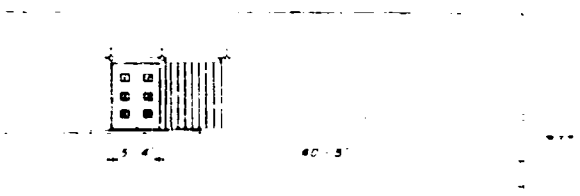
ELEVATION B

SCALE 1/8" = 1'-0"

ELEV

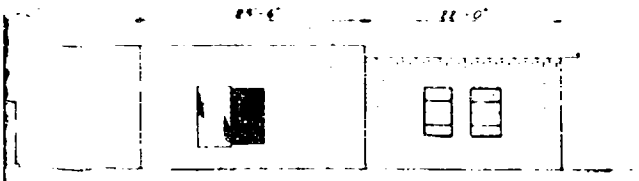
SCAL





PLAN OF SHELTER

SCALE $\frac{1}{16}$" = 1'-0"



ELEVATION C

SCALE $\frac{1}{8}$" = 1'-0"

REVISION	DATE	DESCRIPTION	BY	APPROVED

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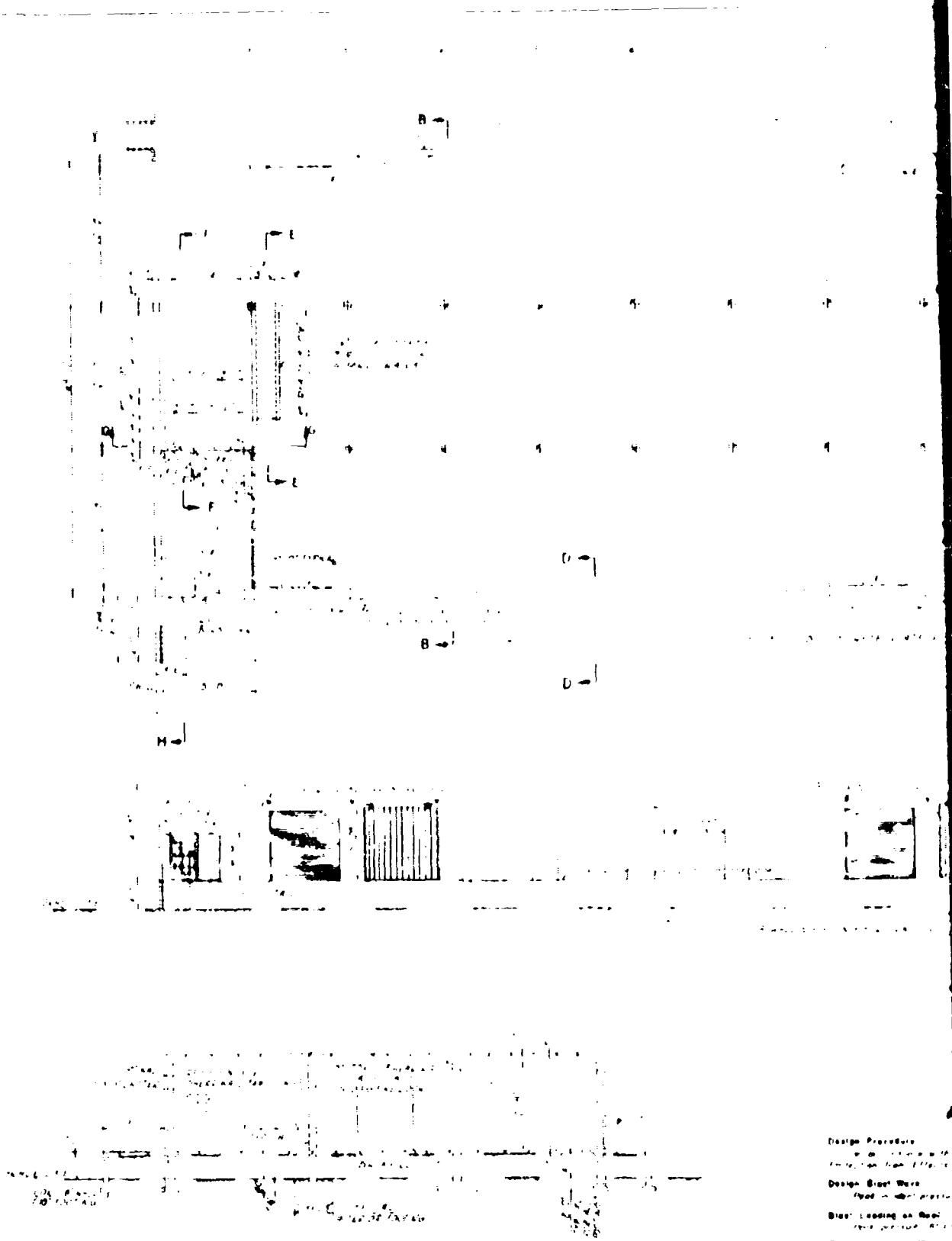
DEPARTMENT OF THE ARMY
OFFICE OF THE CHIEF OF ENGINEERS
MILITARY CONSTRUCTION ENGINEERING DIVISION
WASHINGTON, D. C.

DRAWN BY: J S

PROTECTIVE CONSTRUCTION
COMMUNICATIONS BUILDING
30 PSI BLAST RESISTANT

SCALE AS SHOWN

DRAWING NUMBER
60-02-56
SHEET 2 OF 2



SECTION A-A

Design Procedure

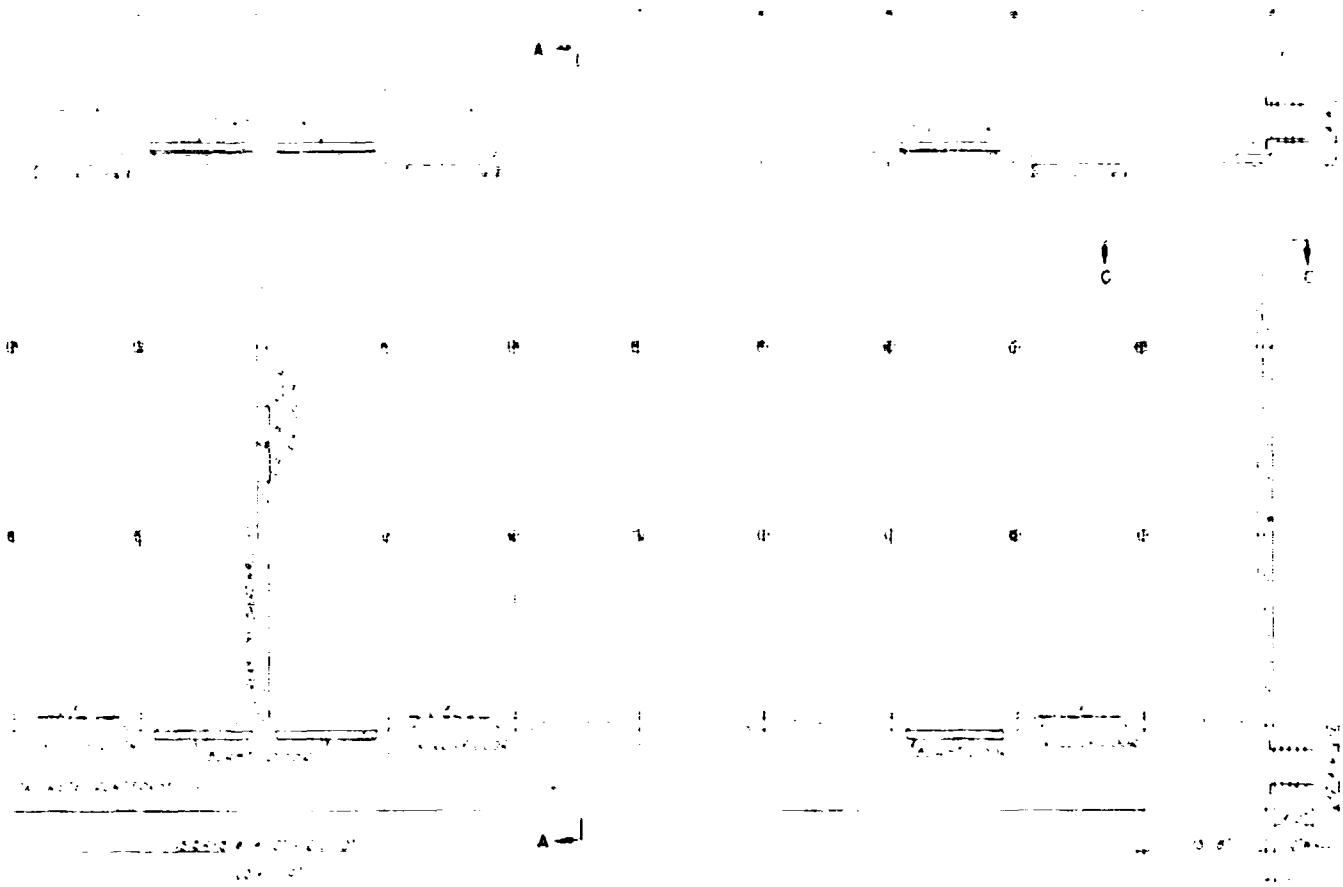
Design Blast Wave

Blast Loading on Roof

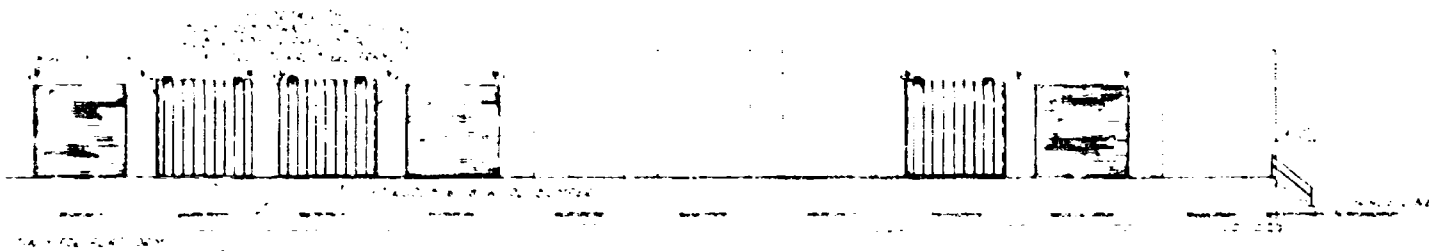
Blast Loading on Walls

Nuclear Radiation Protection

Strength of Materials



FLOOR PLAN



ELEVATION

NOTE

THE 20 AND 30 PSI WAREHOUSES HAVE SHEAR WALLS [illegible] AND [illegible] THICK RESPECTIVELY ON COLUMN LINES 7 AND 16

Design Procedure

[illegible] with C.E. manual "Design of Structures for Protection from Effects of Atomic Weapons"

Design Blast Wave

Peak incident pressure = 10 psi Duration = 155 sec.

Blast Loading on Roof

Peak pressure 10 psi Duration = 155 sec.

Blast Loading on Walls

Peak pressure = 10 psi Duration = 155 sec.

Nuclear Radiation Protection for Shelter Area

Total gamma and neutron attenuation to 5% for a direct exposure at any position which will produce a peak blast pressure equal to 10 psi.

Strength of Materials	Static	Blast Design
Soil Loading (Equiv. ft)	[illegible] psf*	10,000 psf
Concrete f'c	[illegible]	5,000 psi
Reinforcing Steel (ASTM A615 Gr. 60)	[illegible] psi	52,000 psi
Structural Steel (Bolted joints ASTM A7 Gr. 50)	36,000 psi	46,000 psi

*Ultimate capacity of soil

Allowable Stresses and Deflections

[illegible] with allowable stresses to [illegible] with design [illegible] that [illegible] design [illegible] for maximum elastic deformation under dynamic load.

General Notes

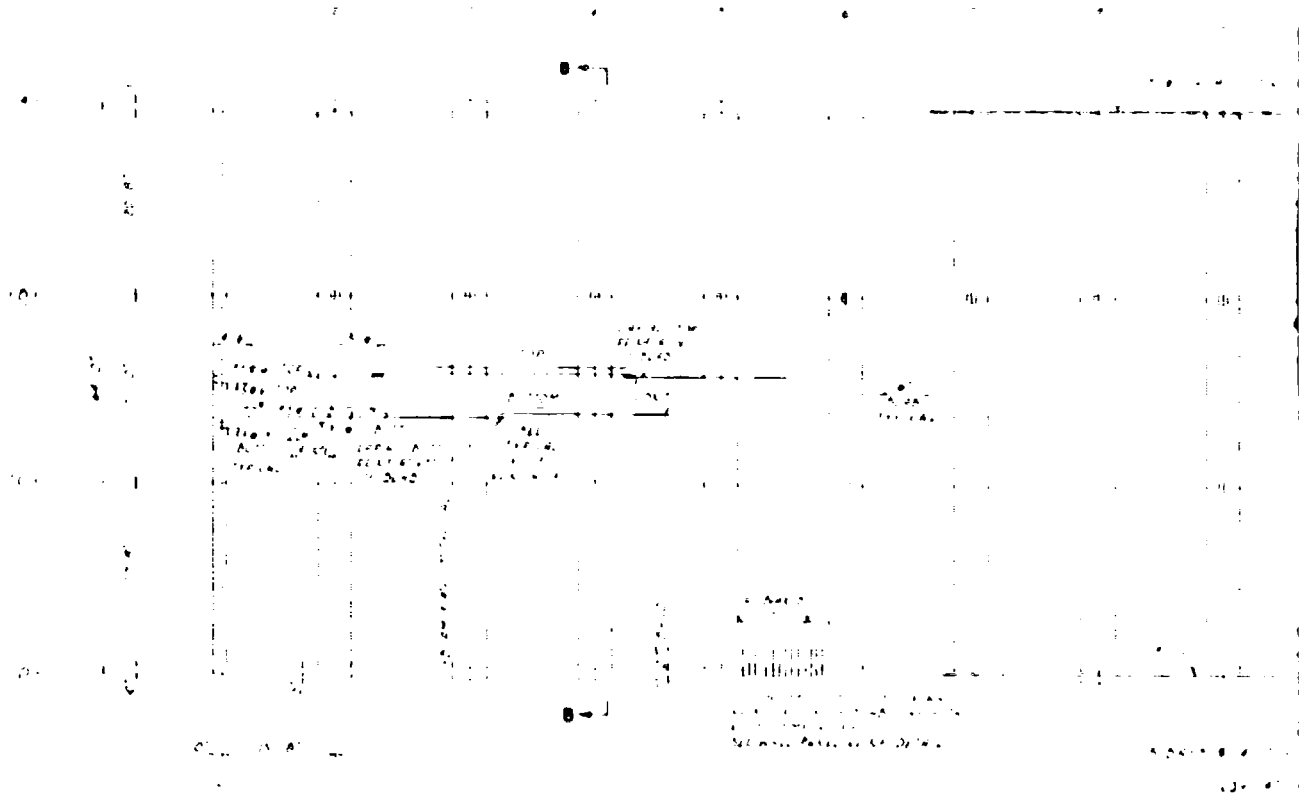
1. The following features are not shown and should be determined to suit use requirements.

[illegible]

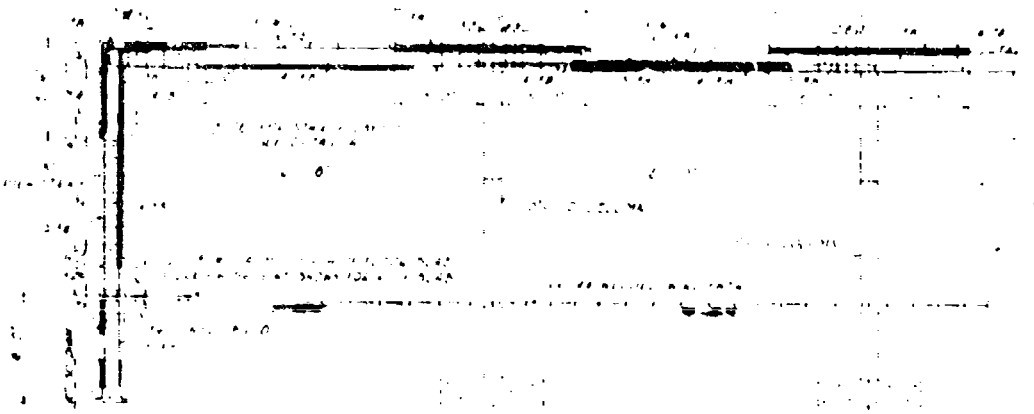
2. [illegible] to be in [illegible] Dept. of the Air Force [illegible] No. 33 UC 32, Master Arch. Drawing No. 33 UC 32.

AMMANN & WHITNEY 111 8th AVENUE, NEW YORK, N.Y.		DEPARTMENT OF THE ARMY OFFICE OF THE CHIEF OF ENGINEERS MILITARY CONSTRUCTION DIVISION WASHINGTON, D.C.		
		PROTECTIVE CONSTRUCTION WAREHOUSE 10 PSI BLAST RESISTANT		
			SCALE 1/8" = 1'-0"	DRAWING NUMBER 60-17-01 SHEET 1 OF 3

2

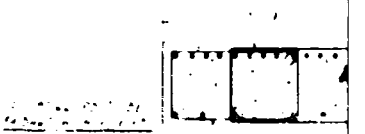


ROOF FRAMING

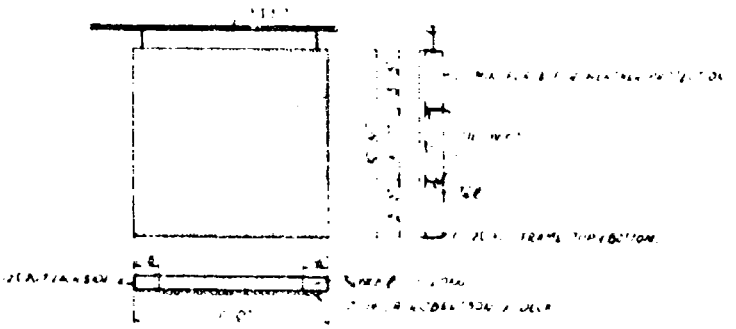


SECTION B-B

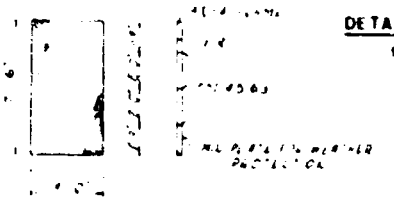
TYPICAL HAUNC



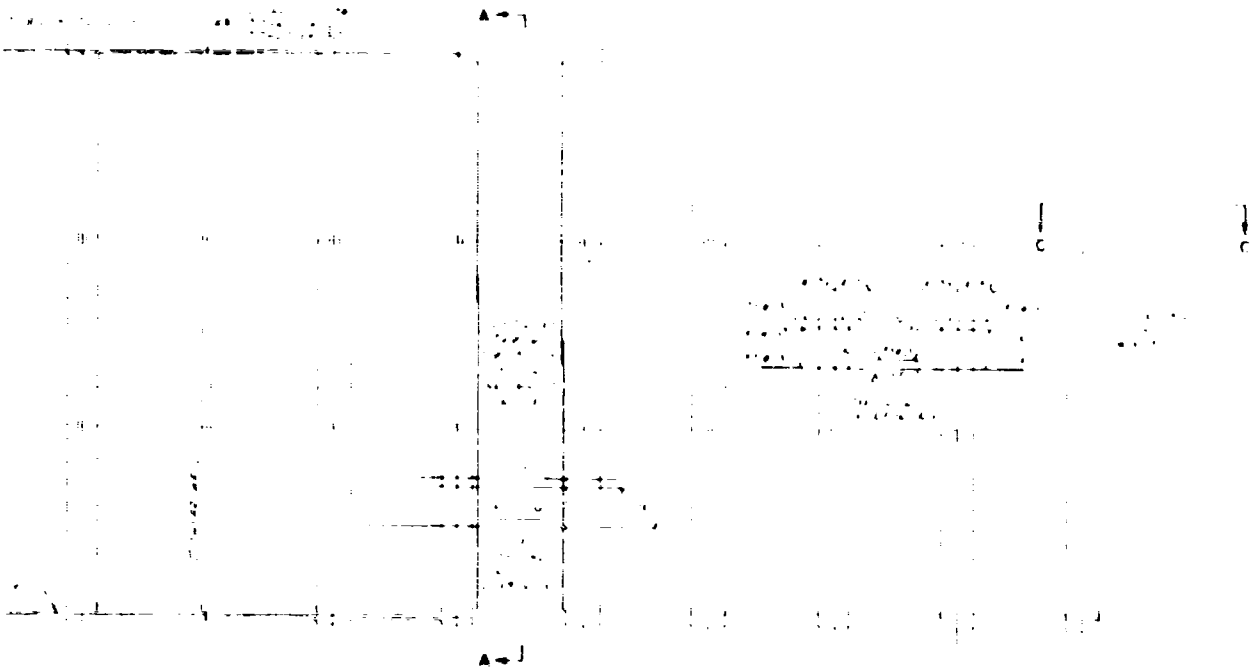
DETAIL A (TYPICAL



DETAIL B (TYPICAL)

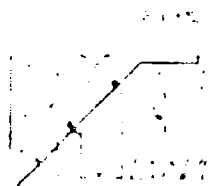


DETAIL C



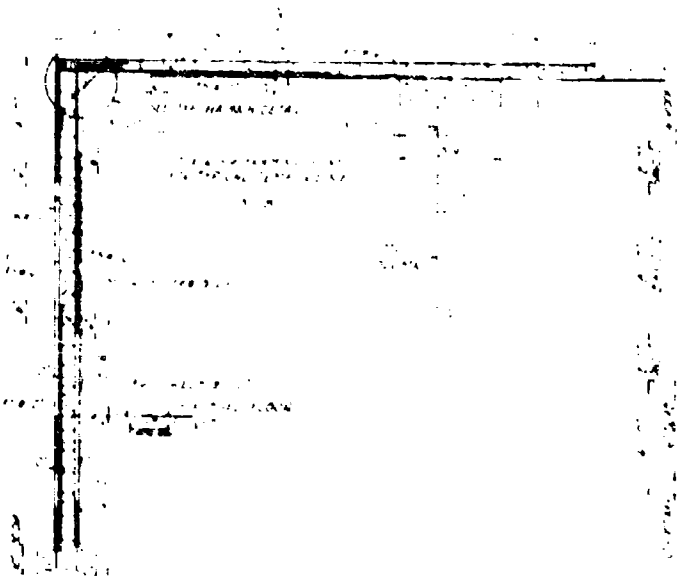
ROOF FRAMING PLAN

SCALE: 1/8" = 1' 0"



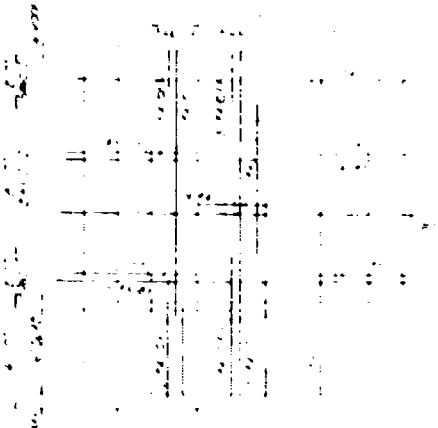
TYPICAL HAUNCH DETAIL

NTS



SECTION C-C

SCALE: 1/8" = 1' 0"



FRONT WA[illegible] PANEL

SCALE: [illegible]

DETAIL A (TYPICAL)

SCALE: 1/4" = 1' 0"

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111 8TH AVENUE NEW YORK N. Y.

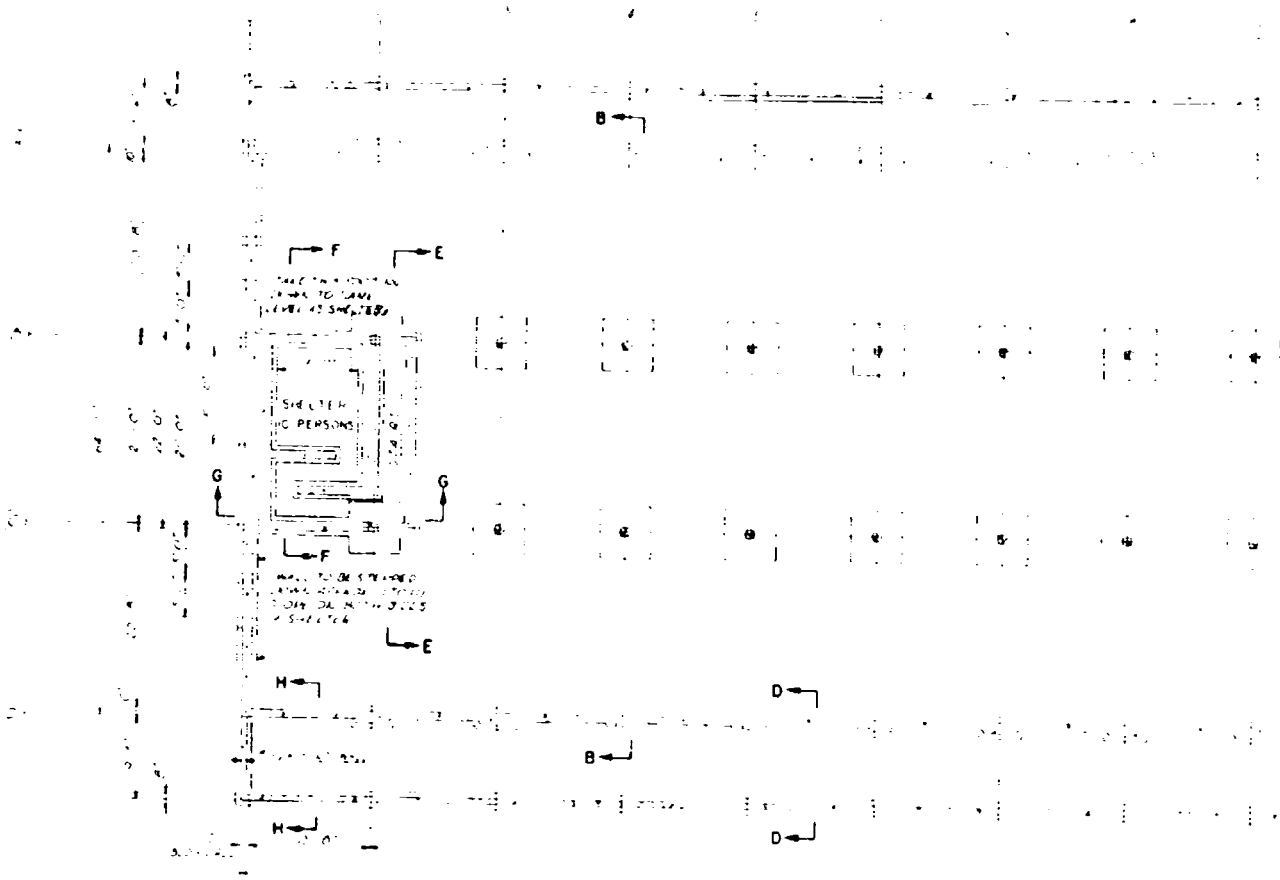
[illegible] DEPARTMENT [illegible] THE ARMY

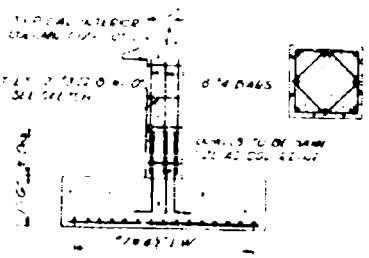
PROTE[illegible]E CONSTRU[illegible]TION

[illegible]AREHOUSE

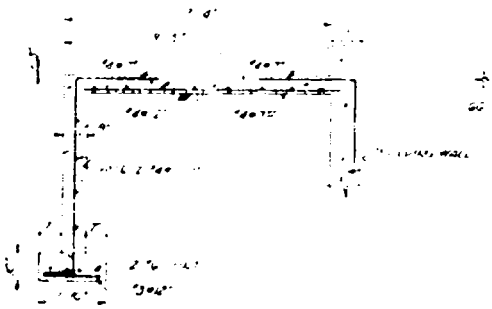
[illegible]O PS[illegible]AST RES[illegible]NT

2

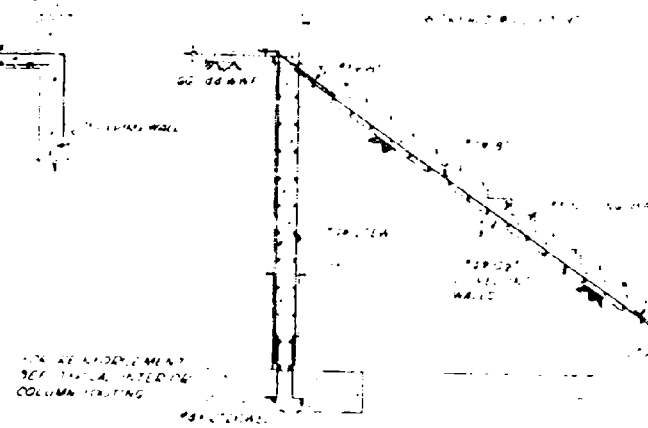




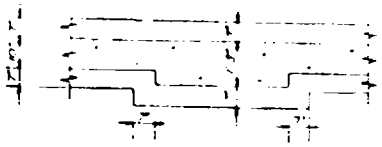
TYPICAL INTERIOR
COLUMN & FOOTING
SCALE: 1/8" = 1'-0"



SECTION D-D
SCALE: 1/8" = 1'-0"



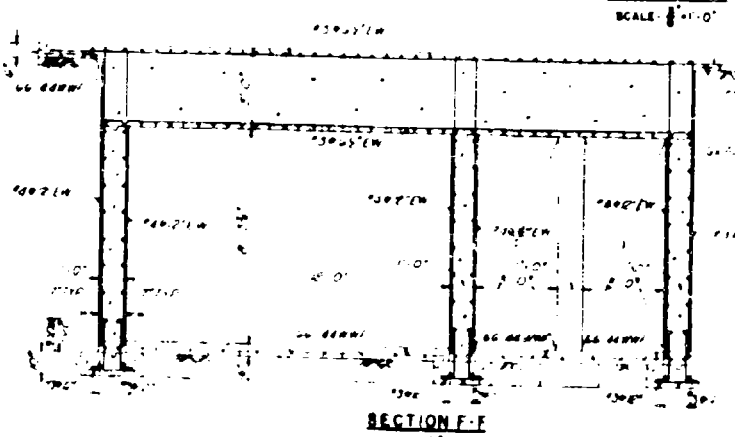
SECTION E-E
SCALE: 1/8" = 1'-0"



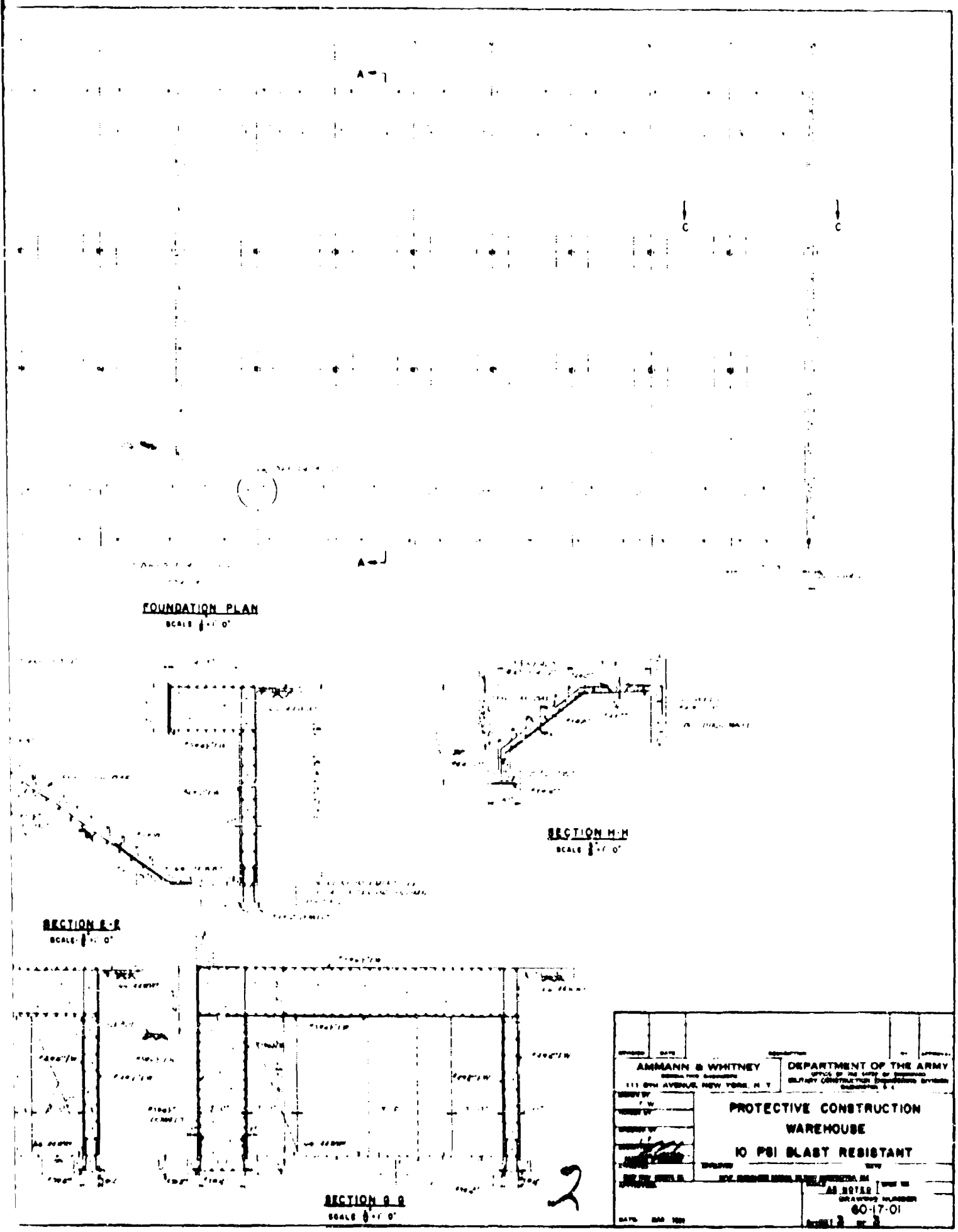
DETAIL D
SCALE: 1/8" = 1'-0"

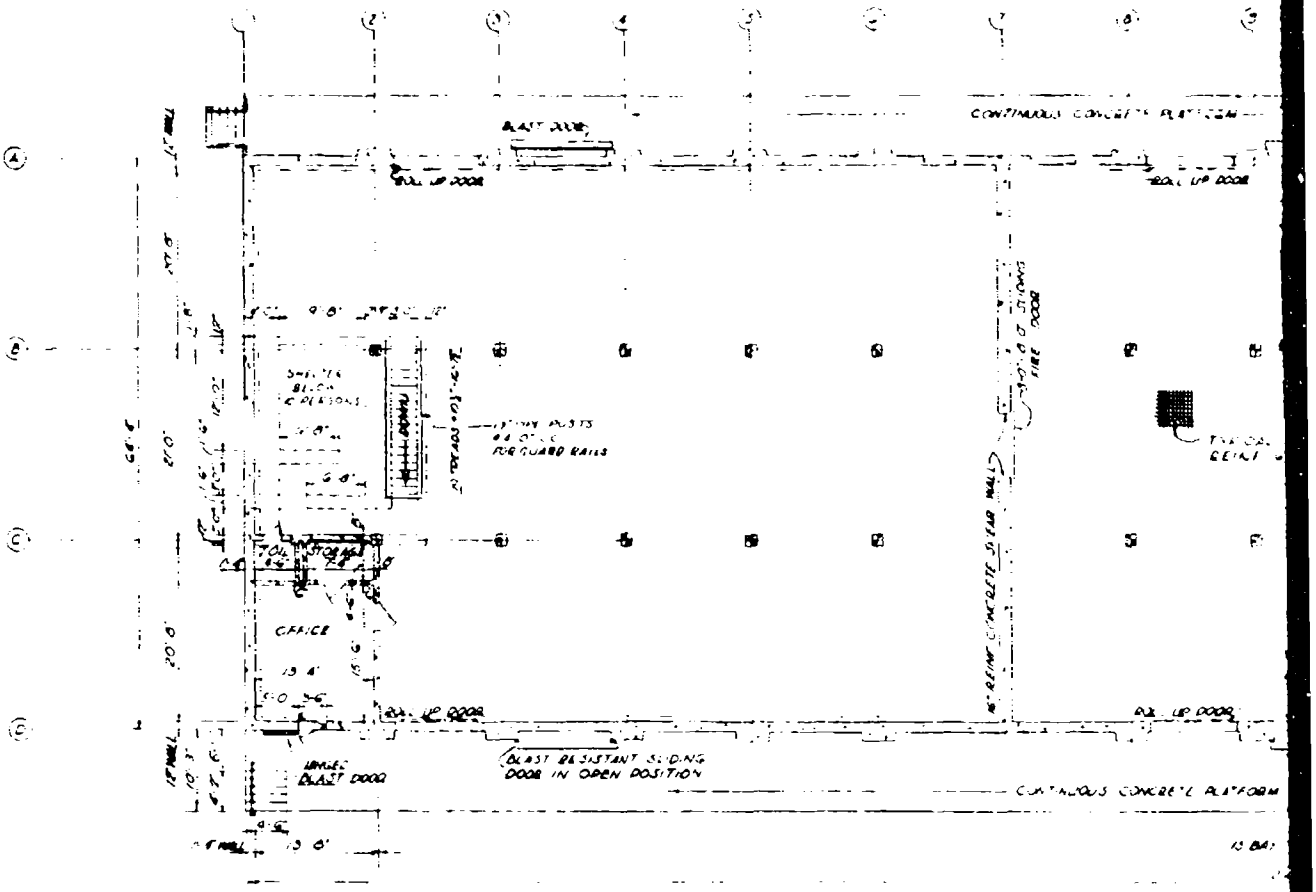
TYPE	SIZE
1	3'-0" x 8'-0"
2	2'-6" x 6'-8"
3	2'-6" x 6'-8"
4	3'-0" x 8'-0" (P)
5	2'-6" x 7'-0"

STANDARD TYPE
DOOR SCHEDULE

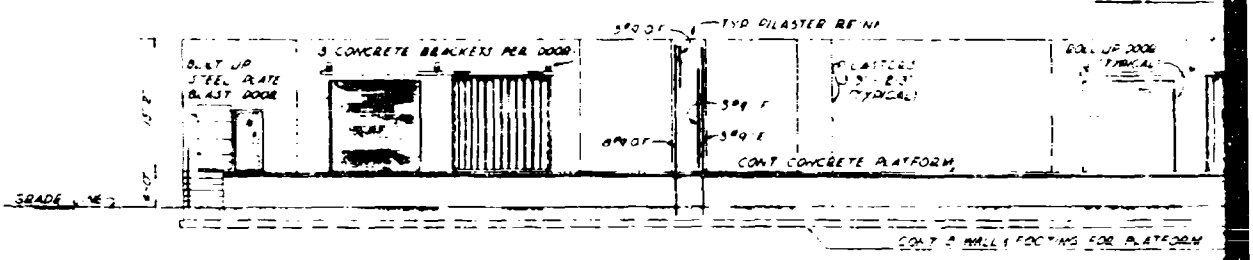


SECTION F-F
SCALE: 1/8" = 1'-0"

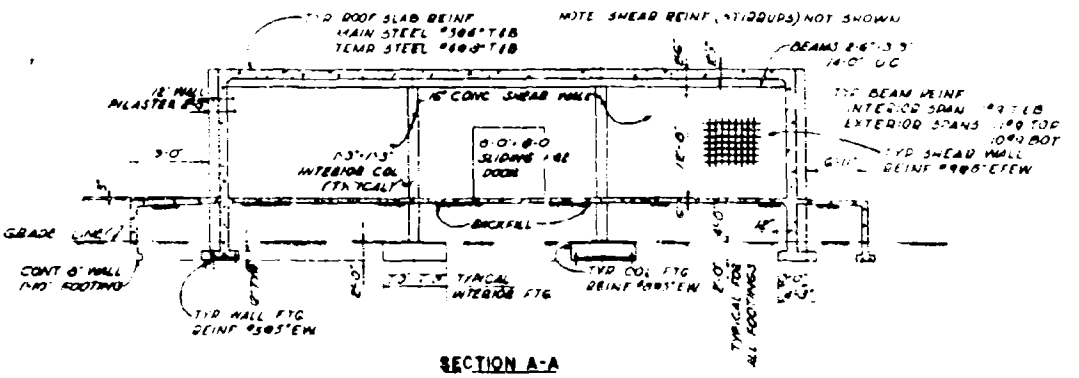

A
A
C
C
FOUNDATION PLAN
SECTION H-H
SECTION E-E
SECTION G-G
AMMANN & WHITNEY
DEPARTMENT OF THE ARMY
PROTECTIVE CONSTRUCTION
WAREHOUSE
10 PSI BLAST RESISTANT
AS NOTED
60-17-01



FLOOR PLAN



ELEVATION



SECTION A-A

Design Procedure

Design Blast W

Blast Loading

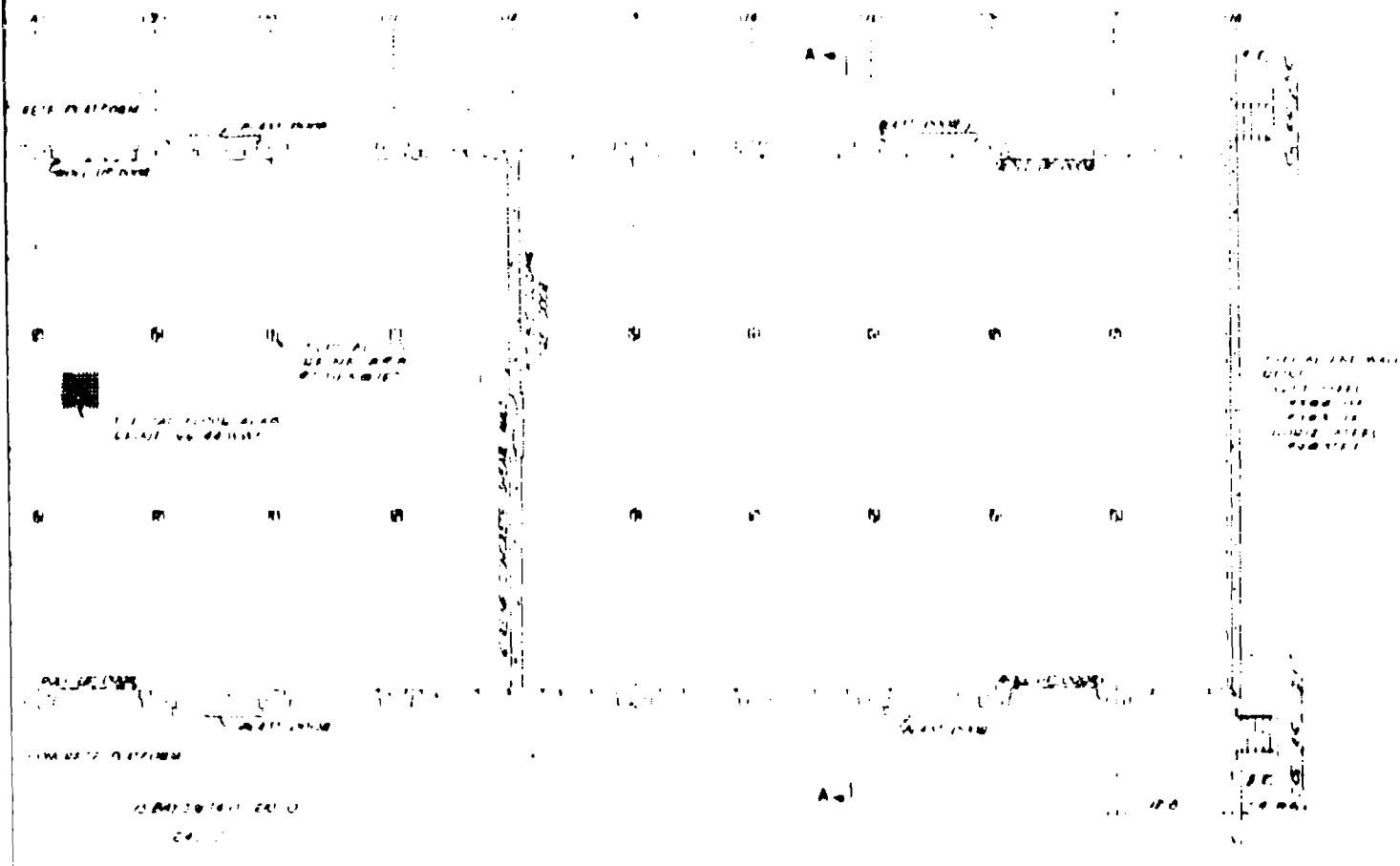
Blast Loading

Nuclear Radiation

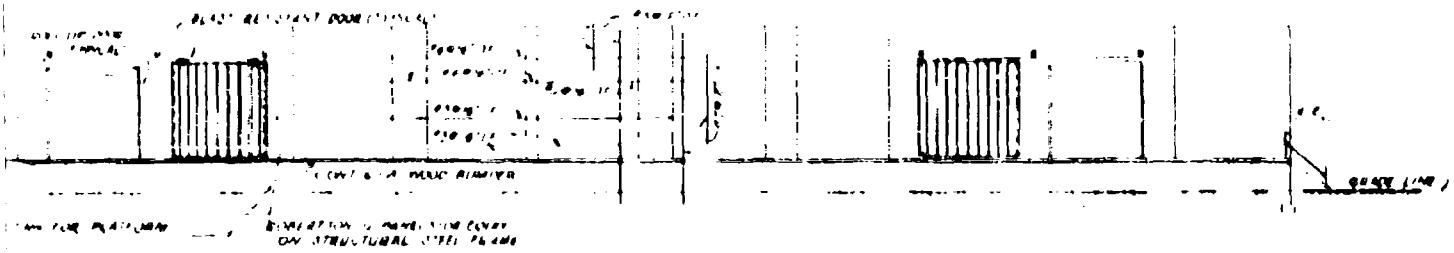
Strength of Ma

Concrete f'c

Structural Steel



FLOOR PLAN



ELEVATION

DESIGN CONDITIONS

Design Procedure

In accordance with [illegible] Manual "Design of [illegible] for Protection from the Effects of Atomic Weapons"

Design Blast Wave

Peak overall pressure 20psi. Duration [illegible] sec

Blast Loading on Roof

Peak pressure [illegible]

Blast Loading on Walls

Peak pressure 28.5psi. Duration [illegible] sec

Quonset Radiation Protection for Shelter Area

Total gamma and neutron attenuation to 0.1r for a [illegible] weapon at any position which will produce a peak free pressure equal to 20 psi

Strength of Materials	Static	Blast Design
Soil Bearing capacity	6000 psf*	18,000 psf
Concrete f'c	4000 psi	5000 psi
Steel: Rigid frame, plate	45,000 psi	60,000 psi
Low Alloy ASTM A572		
Structural Steel, frame, plate	36,000 psi	60,000 psi
(ASTM A-36)		

*Ultimate capacity of soil

Allowable Stresses and Deflections

[illegible]

General Notes

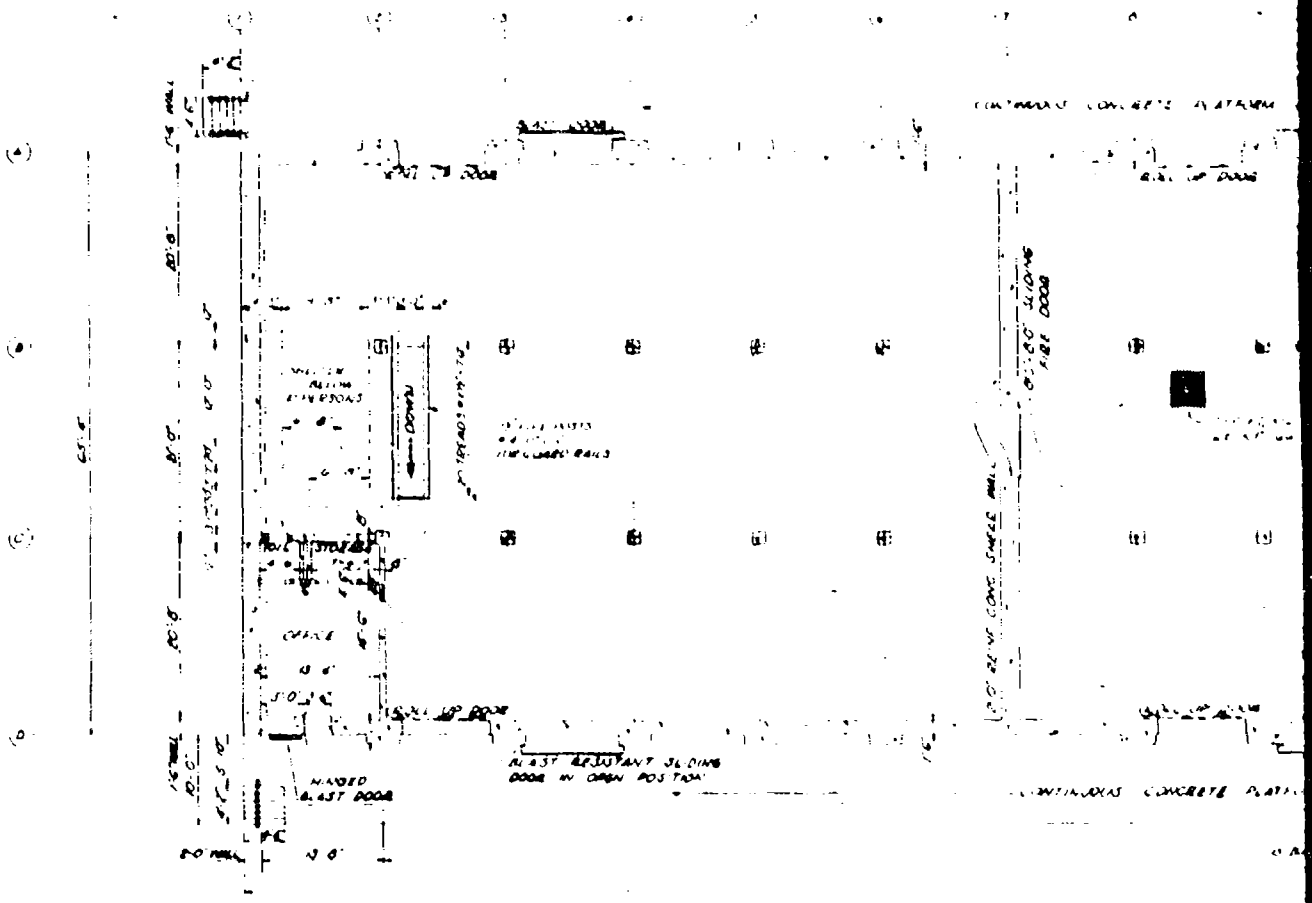
1. The following features are not shown and shall be determined to suit site requirements

Mechanical and electrical equipment
Air ducts and decontamination devices

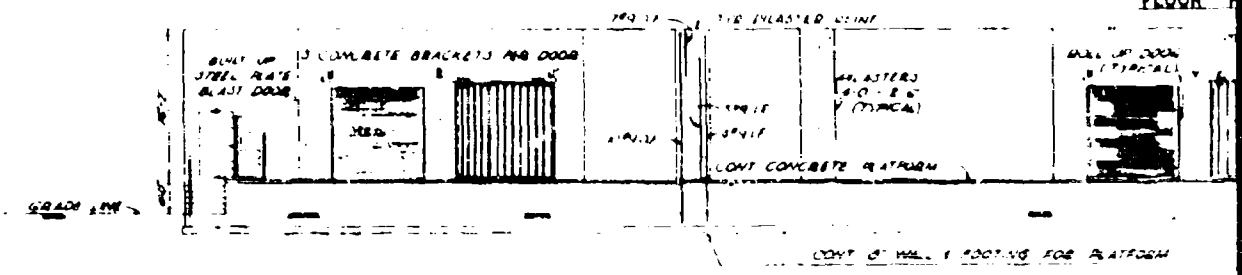
[illegible]

2

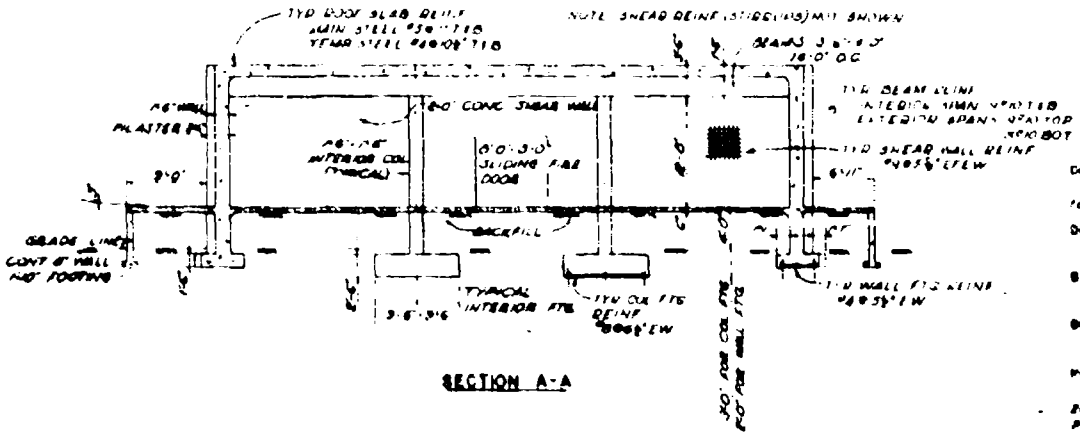
AMMANN & WHITNEY 111 8TH AVENUE NEW YORK, N.Y.		DEPARTMENT OF THE ARMY OFFICE OF THE CHIEF OF ENGINEERS MILITARY CONSTRUCTION DIVISION WASHINGTON, D.C.	
DESIGNED BY A.D. TRACED BY CHECKED BY	PROTECTIVE CONSTRUCTION WAREHOUSE 20 PSI BLAST RESISTANT		
		DRAWING NUMBER 60-17-01	



FLOOR



ELEVATION



SECTION A-A

Design Pressures

Blast Loading on Roof

Blast Loading on

Nuclear Radiation Protection

Strength of Materials

Soil bearing capacity

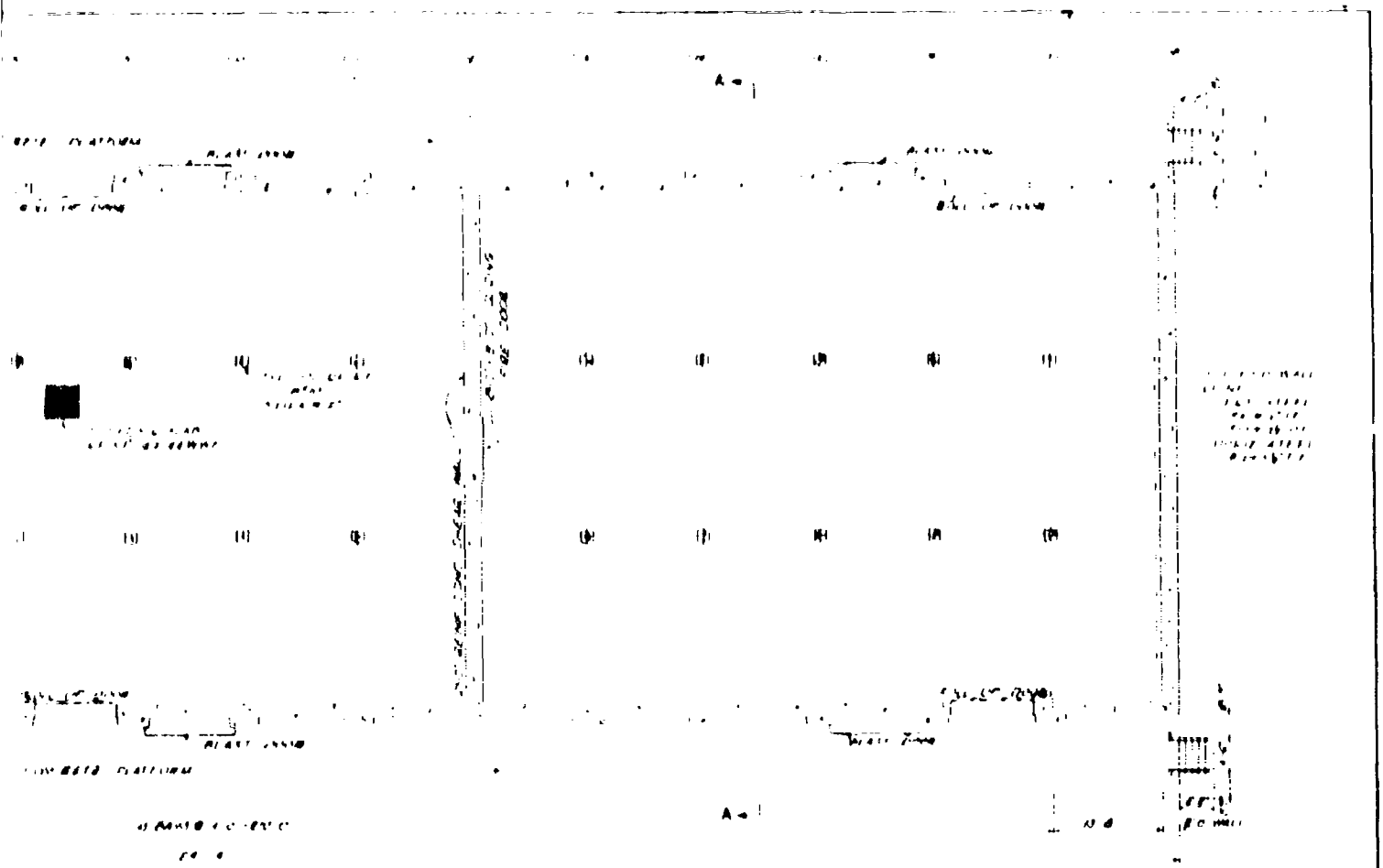
Concrete, f'c

Reinf. Steel, lower yield

Rolled Shapes ASTM A36

Structural Steel, lower yield (ASTM A7, 50)

Allowed capacity of soil



FLOOR PLAN

ELEVATION

DESIGN CONDITIONS

Design Procedure

In accordance with [illegible] manual, Design of Structures to Protection from Effects of Atomic Weapons

Design Blast Wave

Peak overpressure [illegible] 50 psi

Roof Loading on Roof

Peak pressure [illegible] Duration [illegible] sec

Roof Loading on Walls

Peak pressure [illegible] Duration [illegible] sec

Design Radiation Protection for Shelter Area

Total gamma and neutron attenuation is 50 [illegible] a 2 foot section of any portion which will produce a peak blast pressure equal to 50 psi

Strength of Materials	Static	Blast Design
[illegible] bearing capacity	6,000 psf	18,000 psf
[illegible]	4,000 psi	5,000 psi
[illegible] steel tensile yield	33,000 psi	50,000 psi
[illegible] steel, tensile yield	18,000 psi	45,000 psi
[illegible] capacity of soil		

Allowable Stresses and Deflections

[illegible]

General Notes

1. The following items are not shown and shall be determined to suit site requirements

Equipment and other equipment

Air locks and decontamination facilities

[illegible]

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DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
MILITARY CONSTRUCTION ENGINEERING DIVISION
WASHINGTON D.C.

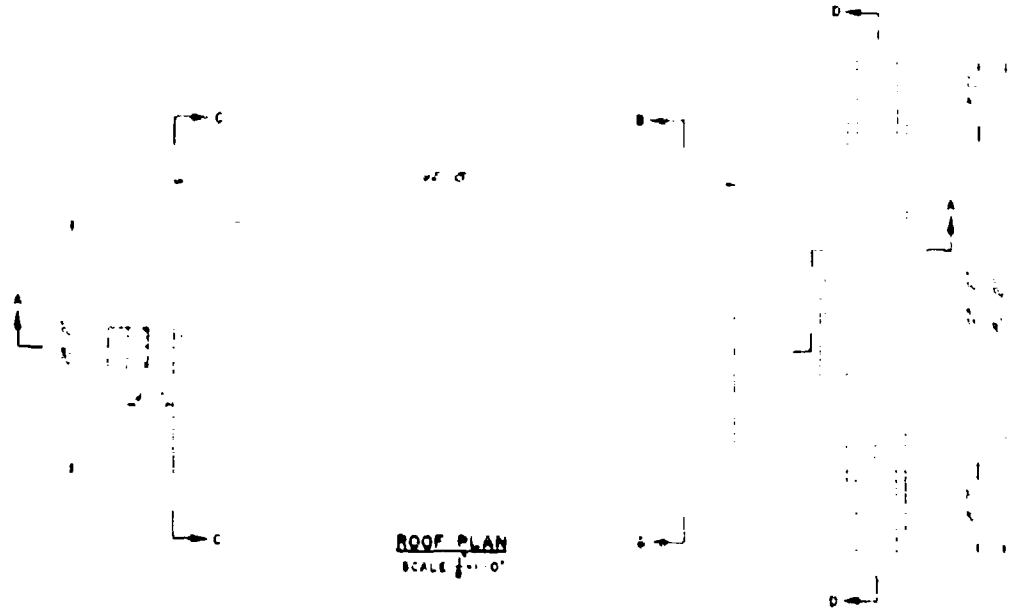
DRAWN BY R.R.
TRACED BY
DESIGNED BY
CHECKED BY
SUBMITTED BY
APPROVED BY

PROTECTIVE CONSTRUCTION
WAREHOUSE
50 PSI BLAST RESISTANT

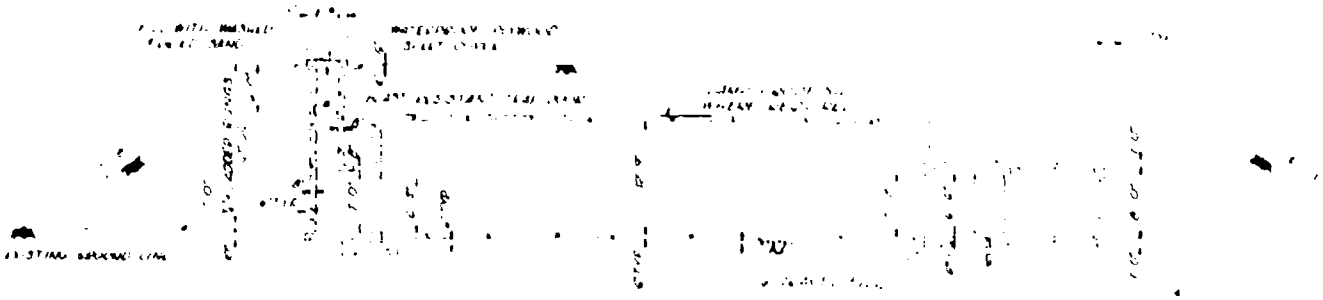
SCALE 1/4" = 1'-0"
DRAWING NUMBER 60-17-01
SHEET 1 OF 1

DATE OCT 1966

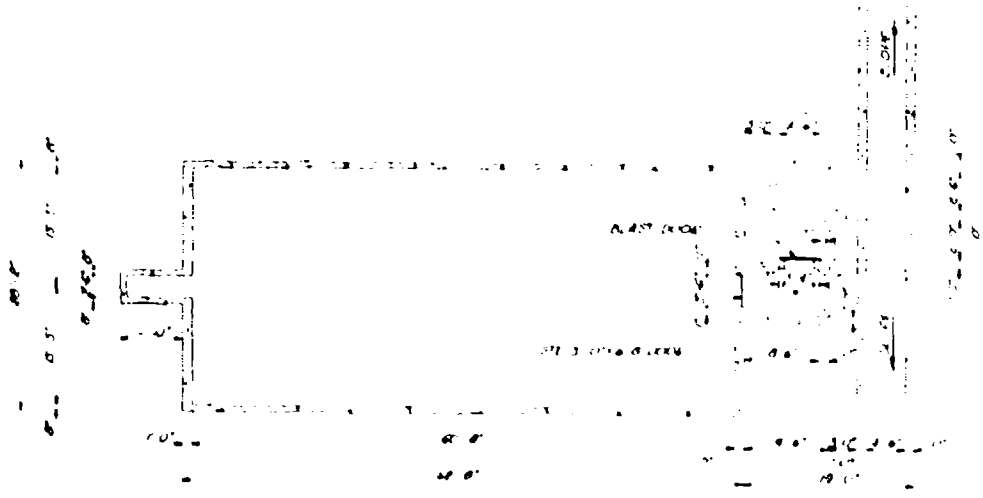
2



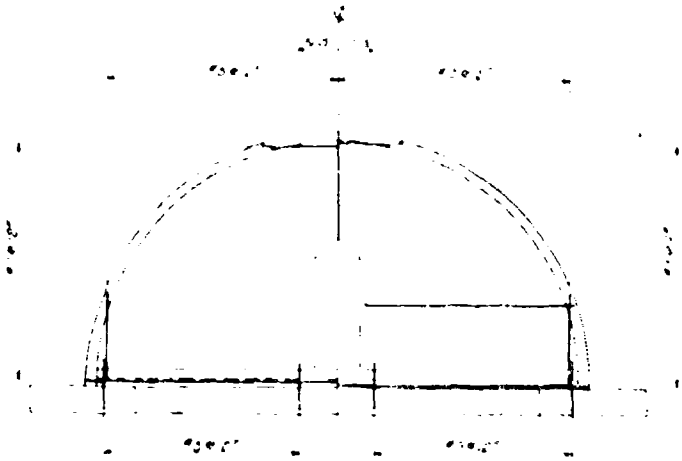
ROOF PLAN
SCALE 1/8" = 1'-0"



SECTION A-A
SCALE 1/8" = 1'-0"



FLOOR PLAN
SCALE 1/8" = 1'-0"



SECTION C-C

SCALE 1/4"=1'-0"

DESIGN CONDITIONS

Design Procedure

[illegible]

Design Blast Wave

[illegible]

Blast Loading on Arch Surface

[illegible]

Nuclear Radiation Protection

[illegible]

Strength of Materials

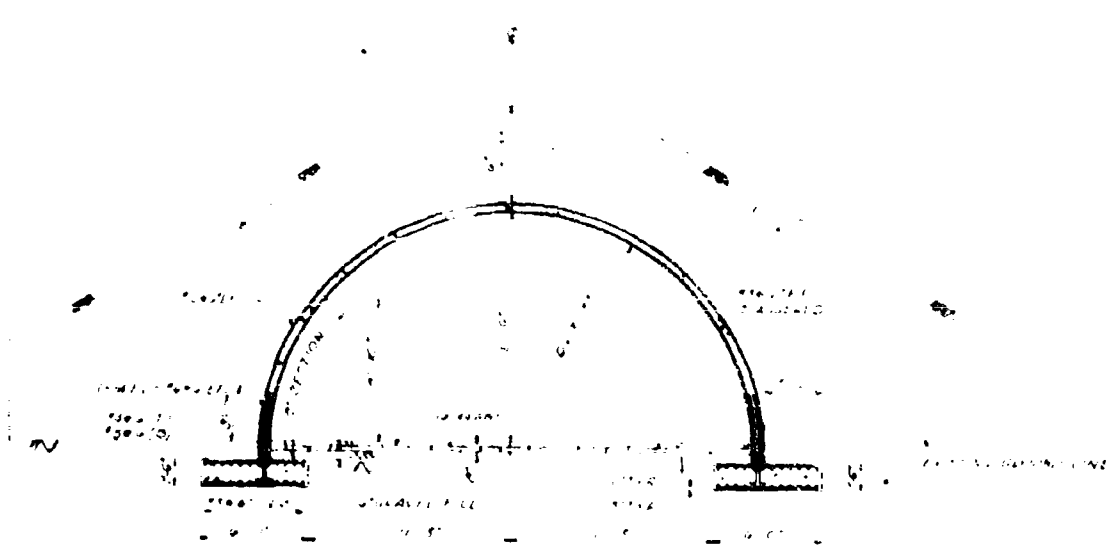
	Static	Blast Design
[illegible]	[illegible]	[illegible]
Concrete [illegible]	[illegible]	[illegible]
Reinforcing steel, lower yield [illegible]	[illegible]	[illegible]
[illegible]		
Structural steel, lower yield [illegible]	[illegible]	[illegible]
[illegible]		

Allowable Stresses and Deflections

[illegible]

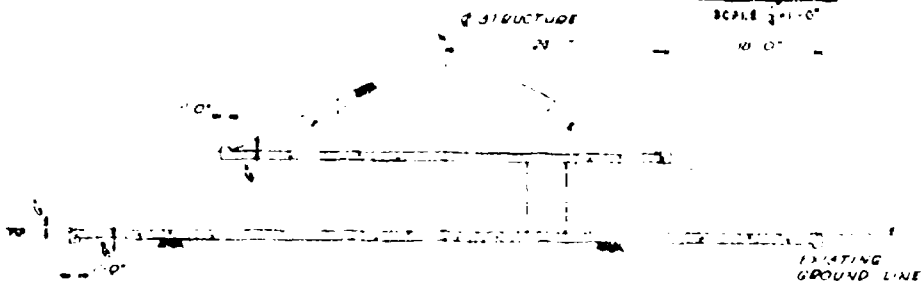
General Notes

[illegible]



SECTION B-B

SCALE 1/4"=1'-0"



SECTION D-D

SCALE 1/4"=1'-0"

REVISION	DATE	DESCRIPTION	BY	APPROVED

AMMANN & WHITNEY
CONSULTING ENGINEERS
111 8TH AVENUE, NEW YORK, N.Y.

DEPARTMENT OF THE ARMY
OFFICE OF THE CHIEF OF ENGINEERS
MILITARY CONSTRUCTION ENGINEERING DIVISION
WASHINGTON, D.C.

DESIGN BY F.W.
DRAWN BY
CHECKED BY L.B.
APPROVED BY

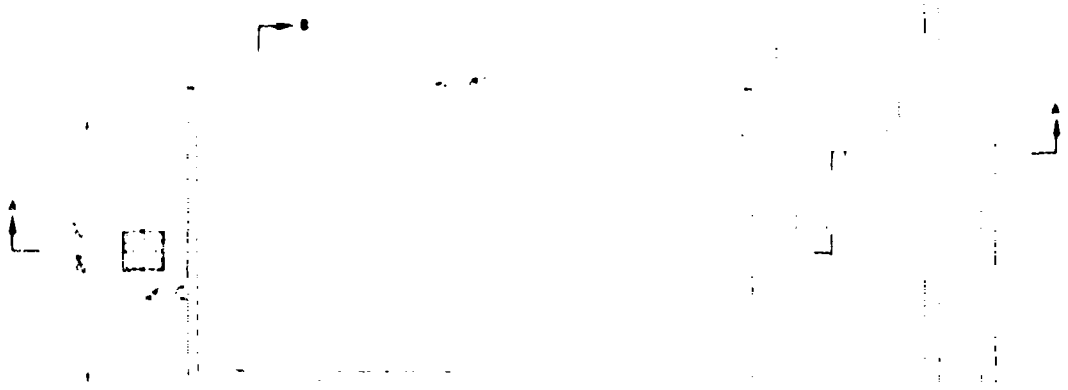
PROTECTIVE CONSTRUCTION EARTH COVERED CONCRETE IGLOO MAGAZINE 25 PSI BLAST RESISTANT

SCALE AS NOTED

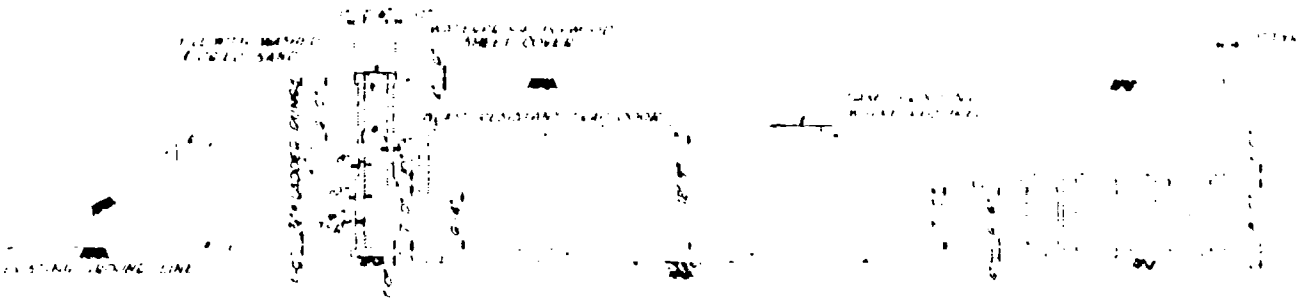
DRAWING NUMBER 60-17-02

DATE MAR 1960

SHEET 1 OF 1

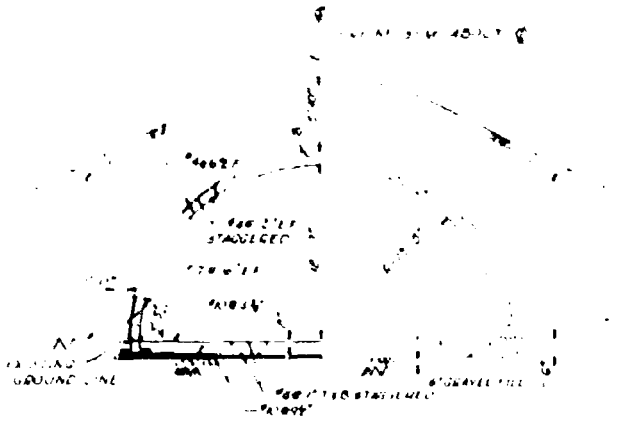


ROOF PLAN
SCALE 1/8" = 1'-0"



SECTION A-A
SCALE 1/8" = 1'-0"

FLOOR PLAN
SCALE 1/8" = 1'-0"



SECTION B-B

SCALE 1"=1'-0"

DESIGN CONDITIONS

Design Procedure

[illegible]

Design Blast Wave

[illegible]

Blast Loading on Arch Surface

[illegible]

Nuclear Radiation Protection

[illegible]

Strength of Materials

	Static	Blast Design
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]

Allowable Stresses and Deflections

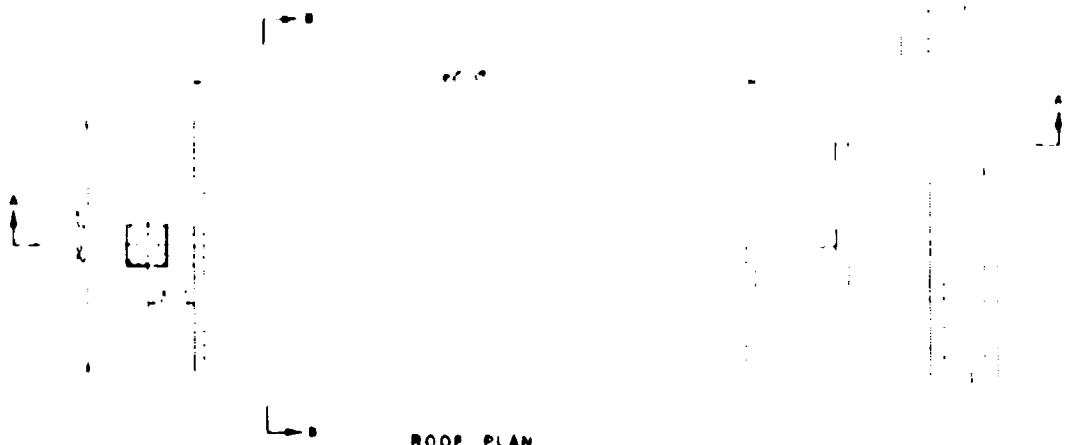
[illegible]

General Notes

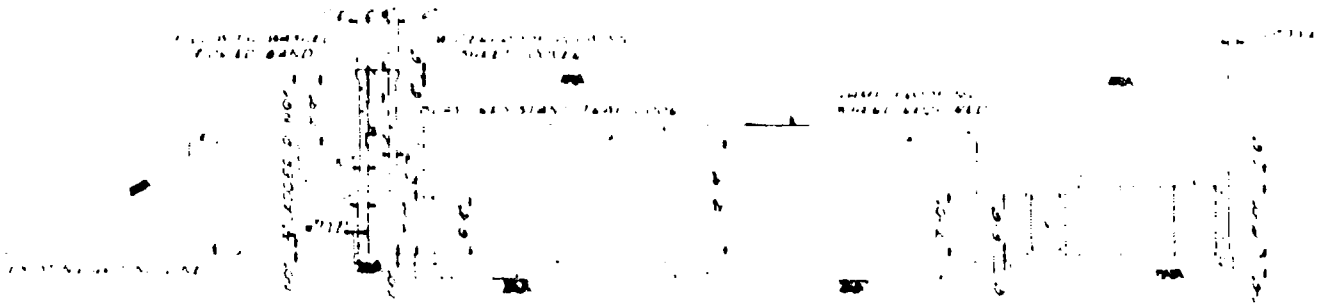
[illegible]

AMMANN & WHITNEY CONSULTING ENGINEERS 111 8TH AVENUE, NEW YORK, N. Y.	DEPARTMENT OF THE ARMY OFFICE OF THE CHIEF OF ENGINEERS MILITARY CONSTRUCTION [illegible] DIVISION WASHINGTON, D.C.
DRAWN BY F.J.W. TRACED BY DESIGNED BY B CHECKED BY	PROTECTIVE CONSTRUCTION EARTH COVERED CONCRETE IGLOO MAGAZINE 50 PSI BLAST RESISTANT
APPROVED DATE [illegible]	SCALE AS NOTED DRAWING NUMBER 60-17-02 SHEET 1 OF 1

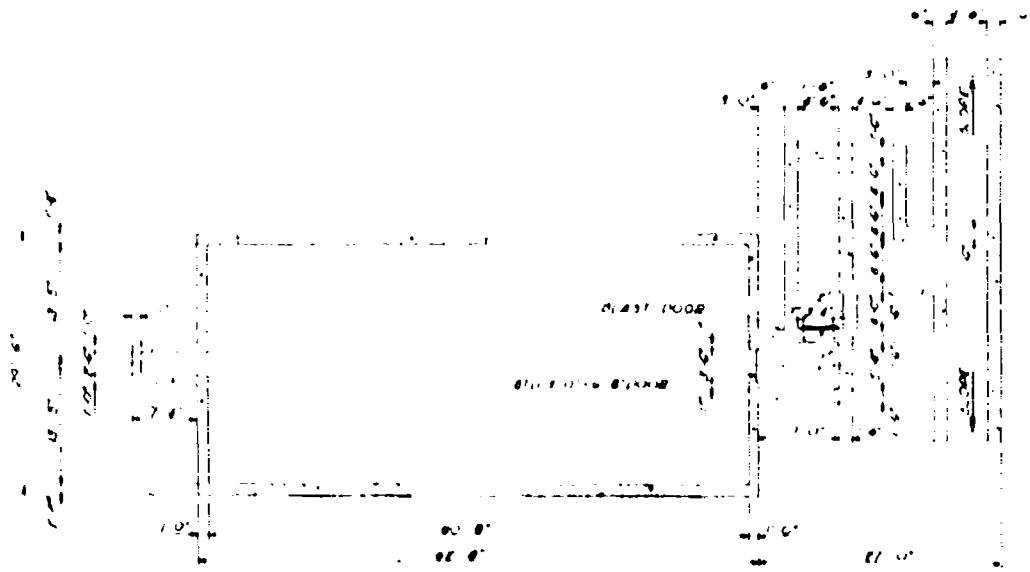
2



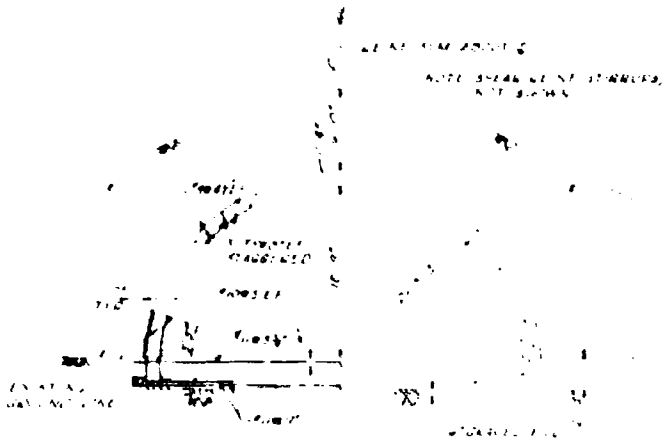
ROOF PLAN
SCALE 1/8" = 1'-0"



SECTION A-A
SCALE 1/8" = 1'-0"



FLOOR PLAN
SCALE 1/8" = 1'-0"



SECTION B-B

SCALE 1/8" = 1'-0"

DESIGN

Design Procedure

Design Blast Wave

Blast Loading on Arch Surface

Nuclear Radiation Protection

Strength of Materials

Allowable Stresses and Deflections

General Notes

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CONSULTING ENGINEERS
111 8TH AVENUE, NEW YORK, N. Y.

DEPARTMENT OF THE ARMY

DRAWN BY F.J.K.
DESIGNED BY L.B.

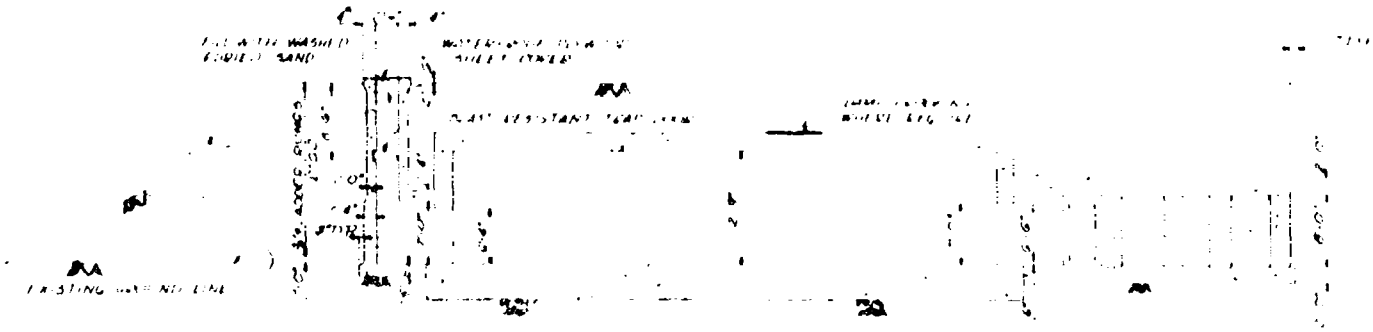
PROTECTIVE CONSTRUCTION
EARTH COVERED
CONCRETE IGLOO MAGAZINE
100 PSI BLAST RESISTANT

DATE

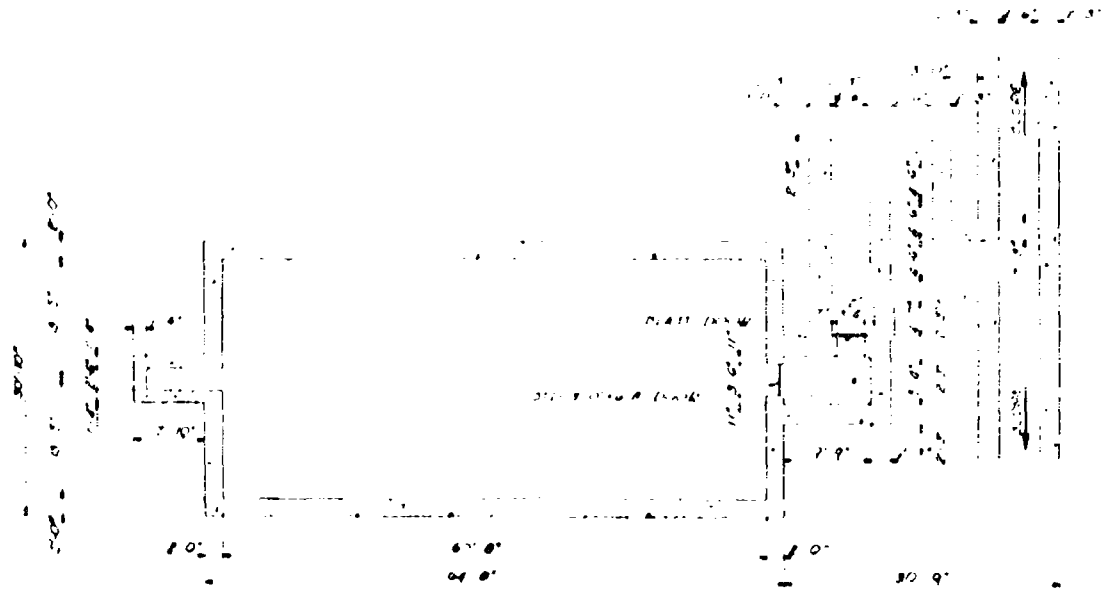
SHEET 1 OF 1

2

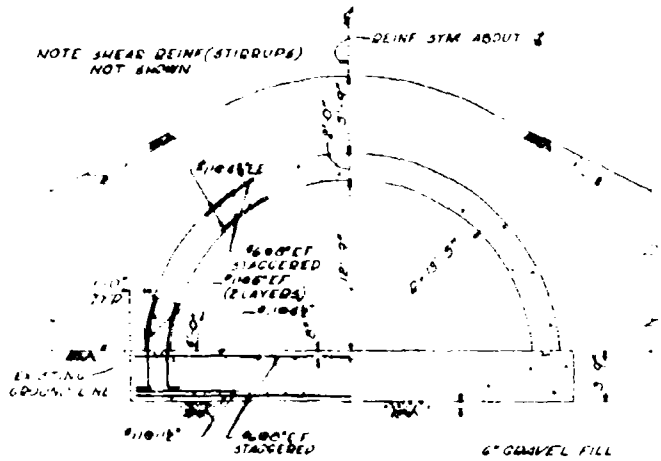
ROOF PLAN
SCALE 1/8" = 1'-0"



SECTION A-A
SCALE 1/8" = 1'-0"



FLOOR PLAN
SCALE 1/8" = 1'-0"



SECTION B-B

SCALE: 1/8" = 1'-0"

DESIGN CONDITIONS

Design Procedure

In accordance with OCE manual, "Design of Structures for Protection from the Effects of Atomic Weapons"

Design Blast Wave

Peak incident pressure = 200psi Duration = 0.45sec

Blast Loading on Arch Surface

Peak pressure = [illegible]

Nuclear Radiation Protection

Total gamma and neutrons attenuated to 50r for a 500KT weapon at any location which will produce a peak blast pressure equal to 200psi

Strength of Materials

	Static	Blast Design
Soil bearing capacity	8,000psf*	16,000psf*
Concrete f'_c	5,000psi	6,500psi
Reinf. Steel lower yield (Int Grade, ASTM A305-50T)	47,000psi	52,000psi
Structural steel, lower yield (ASTM A7-50)	36,000psi	41,600psi

*Rated capacity of soil

Allowable Stresses and Deflections

The foundation, end walls and vent shaft may be designed for plastic deformation under design blast load. Arch designed for maximum allowable horizontal deflection at crown equal to R/50. Blast door and escape hatch door designed for maximum elastic deformation under design blast load.

General Notes

1. The following features are not shown and should be determined to suit use requirements:
   - Interior partitions
   - Mechanical and electrical equipment
   - Air locks and decontamination facilities
2. Access ramps may be provided if required for vehicles.
3. Thermal protection to be applied to all exterior doors.
4. Structure may be lowered to balance cut and fill if desired.

REVISIONS	DATE	DESCRIPTION	BY	APPROVAL

AMMANN & WHITNEY
CONSULTING ENGINEERS
111-8TH AVENUE, NEW YORK, N. Y.

DEPARTMENT OF THE ARMY
OFFICE OF THE CHIEF OF ENGINEERS
MILITARY CONSTRUCTION ENGINEERING DIVISION
WASHINGTON, D. C.

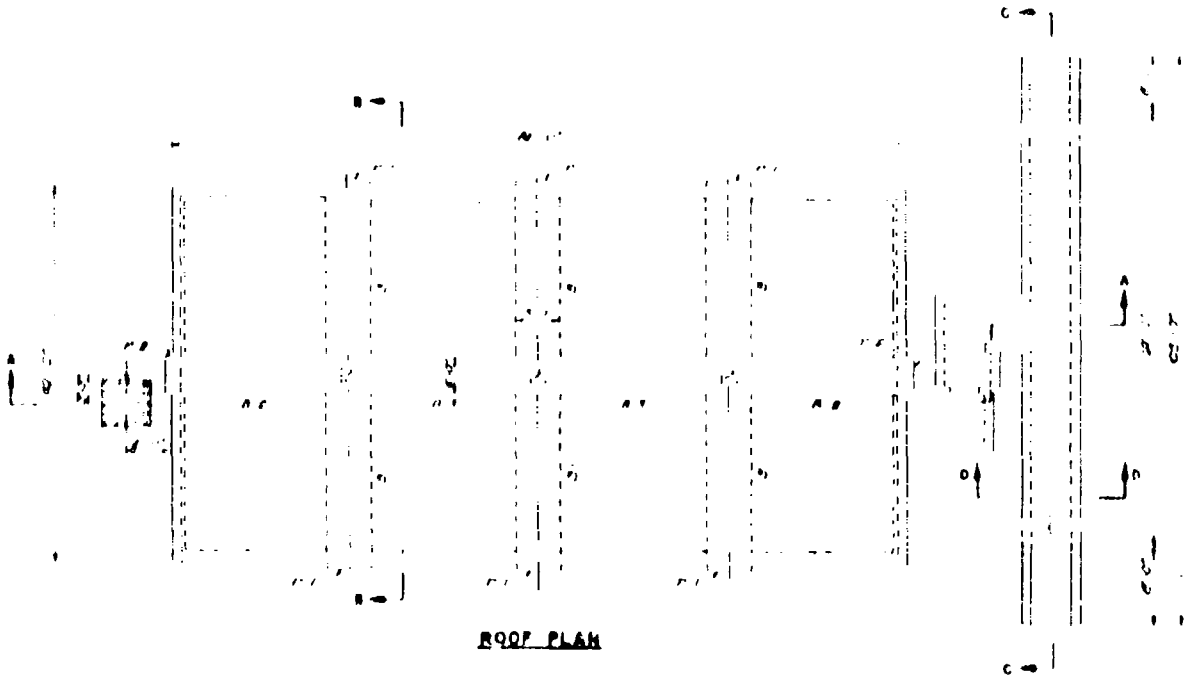
DESIGN BY F.J.W.

PROTECTIVE CONSTRUCTION
EARTH COVERED
CONCRETE IGLOO MAGAZINE
200 PSI BLAST RESISTANT

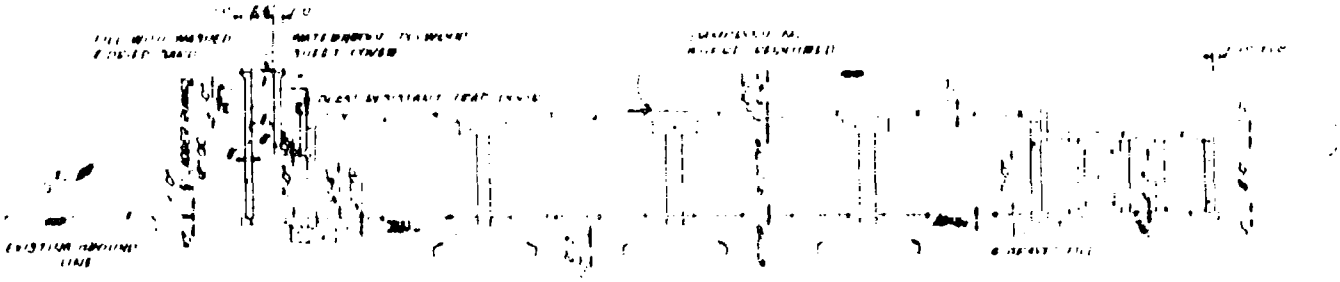
SCALE: AS NOTED

DRAWING NUMBER 60-17-02

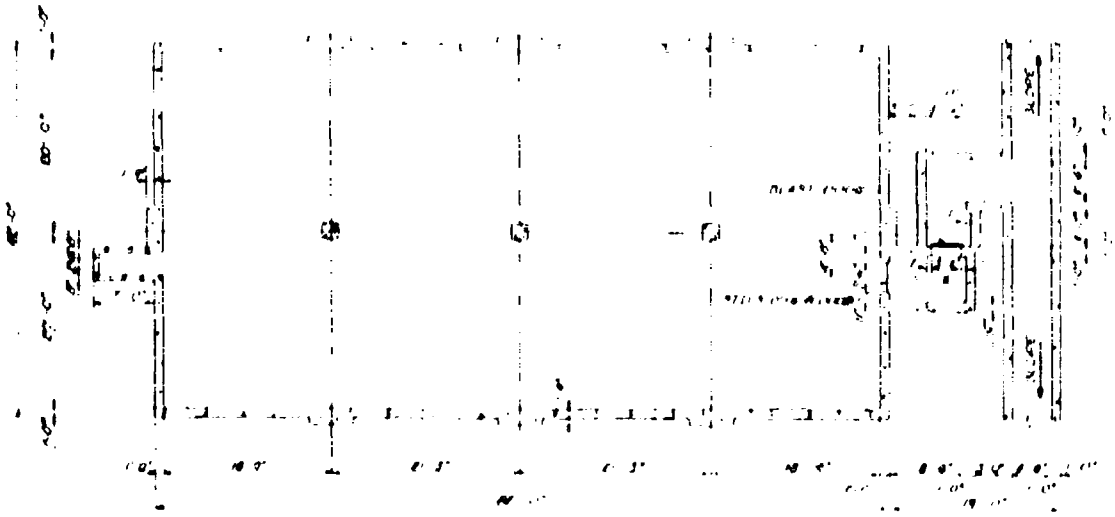
SHEET 1 OF 1



ROOF PLAN



SECTION A A



FLOOR PLAN

DESIGN CONDITIONS

Design Procedure

In accordance with OCE manual, "Design of Structures for Protection from the Effects of Atomic Weapons"

Design Blast Wave

Peak incident pressure = 25psi Duration = 1.12 sec

Blast Loading on Roof and Walls

Peak pressure [illegible] psi Duration = 1.12 sec

Nuclear Radiation Protection

Total gamma and neutron attenuated to 50r for a 20KT weapon at any position which will produce a peak blast pressure equal to [illegible] psi

Strength of Materials	Static	Blast Design
Soil bearing capacity	8,000psf*	16,000psf
Concrete, f'c	4,000psi	5,200psi
Roof steel, lower yield (Int. Grade, ASTM A615-50T)	47,500psi	52,000psi
Structural steel, lower yield (ASTM A7-50)	38,000psi	41,600psi

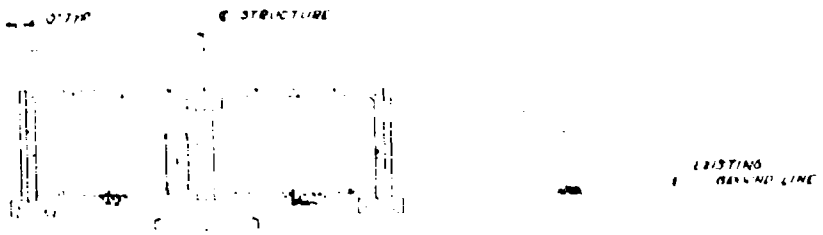
*Ultimate capacity of soil

Allowable Stresses and Deflections

Roof, walls, foundation and exterior wall designed for plastic deformation under design blast load. Blast door and escape hatch designed for maximum elastic deformation under design blast load.

General Notes

1. The following features are not shown and shall be determined to suit site requirements
   - Interior partitions
   - Mechanical and electrical equipment
   - Air locks and decontamination facilities
2. Access ramp may be provided if required for vehicles
3. Structure may be [illegible] if desired



SECTION B-B

REVISION	DATE	DESCRIPTION	BY	APPROVAL

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CONSULTING ENGINEERS
111 8th AVENUE, NEW YORK, N.Y.

DEPARTMENT OF THE ARMY
OFFICE OF THE CHIEF OF ENGINEERS
MILITARY CONSTRUCTION ENGINEERING DIVISION
WASHINGTON, D.C.

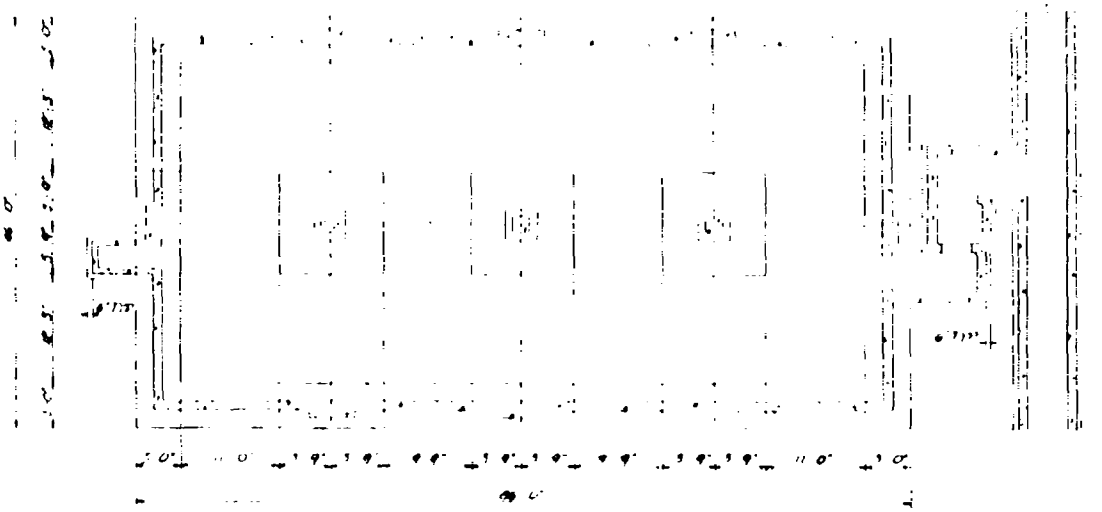
DESIGNED BY J.S.
DRAWN BY
CHECKED BY N.O.
APPROVED BY

PROTECTIVE CONSTRUCTION
GENERAL PURPOSE STRUCTURE
EARTH COVERED, RECTANGULAR
25 PSI BLAST RESISTANT

SCALE 1/8" = 1'
DRAWING NUMBER 60-18-01
SHEET 1 OF 2

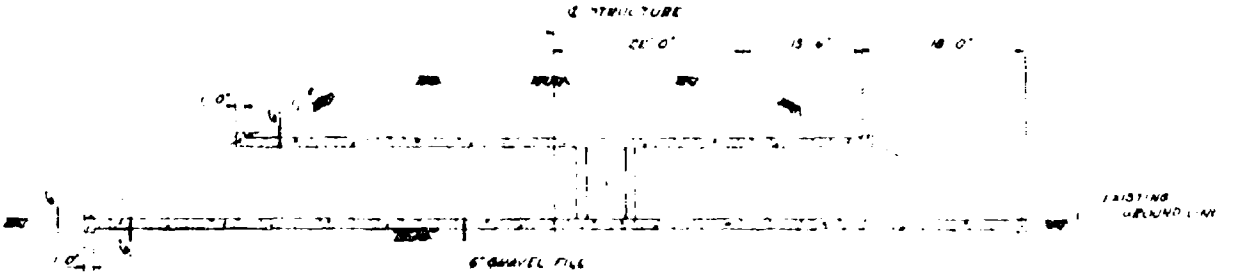
DATE Oct 1959

2



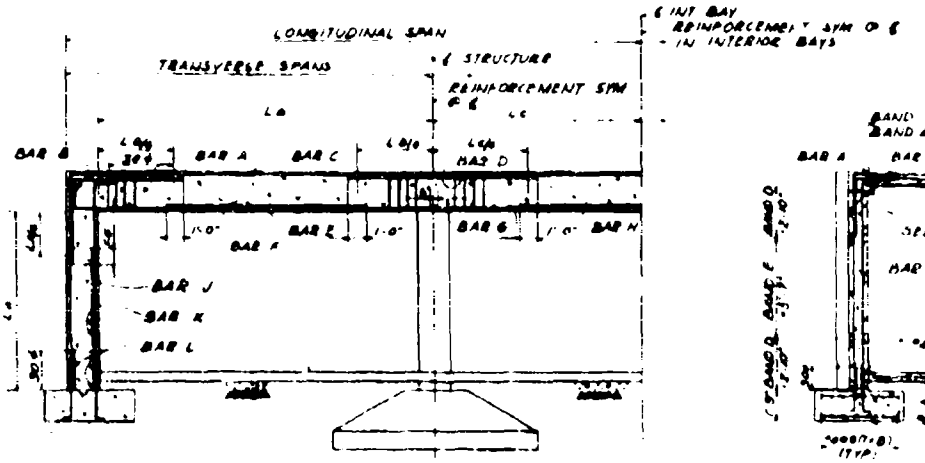
FOUNDATION PLAN

SCALE: 1/8" = 1'-0"



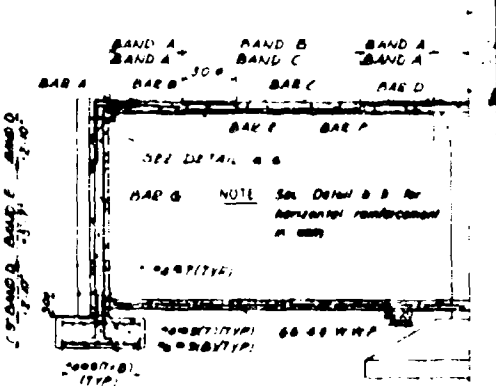
SECTION C-C

SCALE: 1/8" = 1'-0"



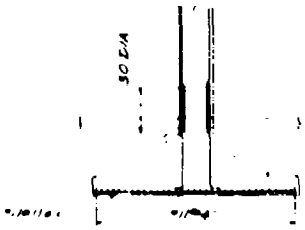
TYPICAL BEAM & PILASTER DETAIL

SCALE 1/4" = 1'-0"



TYPICAL ROOF & WALL DETAIL

SCALE 1/4" = 1'-0"



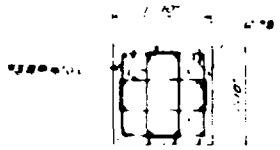
DETAIL OF COLUMN FOOTING

SCALE $\frac{1}{4}$"=1'-0"

BEAM & PILASTER SCHEDULE

MARK NO	SIZE W	SIZE D	BARS A	B	C	D	E	F	G	H	J	K	L	MAX % STIRRUPS AT WALL OR ROOF	AT COL
B 1	60"	27"	5#9	4#9	9#9	8#9	10#11	9#11						0.56	0.36
B 2	48"	27"	4#9	4#9	8#9	8#9	8#9	[illegible]							
B 3	48"	27"			8#9	8#9	9#9	[illegible]						0.53	0.33
P 1	60"	21"	5#9	4#9	—	—	—	—	—	—	5#7	4#7	[illegible]	0.23	
P 2	48"	21"	4#9	4#9	—	—	—	—		—	8#5	—	[illegible]	0.17	

NOTE: A minimum of 0.12% web reinforcement is required in all beams and pilasters



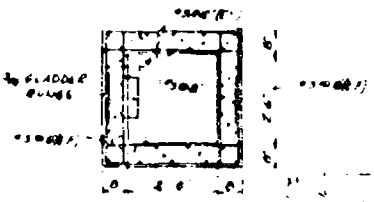
DETAIL OF COLUMN

SCALE $\frac{1}{4}$"=1'-0"

ROOF SLAB & WALL SCHEDULE

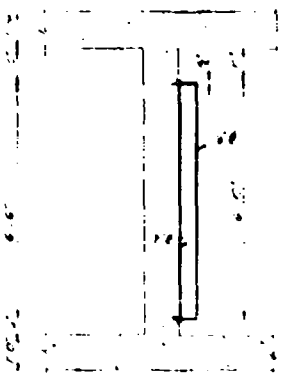
PANEL	BAND	A	B	C	D	E	F	G	H	J	K	L
ROOF	*A	[illegible]		[illegible]		[illegible]						
	H	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]					
	*A	[illegible]		[illegible]		[illegible]						
	*C	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]					
END WALL	A	[illegible]						[illegible]				
	B	[illegible]	[illegible]					[illegible]				
	*D								[illegible]		[illegible]	
	E								[illegible]		[illegible]	
SIDE WALL	A	[illegible]						[illegible]				
	C	[illegible]	[illegible]					[illegible]				
	*D								[illegible]	[illegible]		[illegible]
	*E								[illegible]	[illegible]		[illegible]

NOTE: *Outer layer of steel



SECTION E-E

SCALE $\frac{1}{4}$"=1'-0"

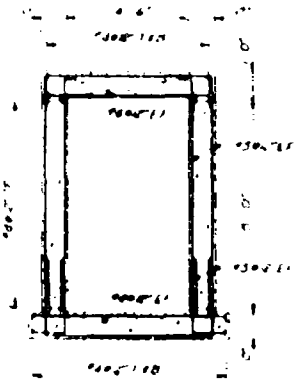


SECTION F-F

SCALE $\frac{1}{4}$"=1'-0"

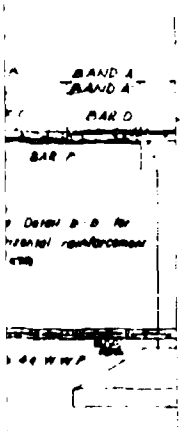
DETAIL OF STEEL BLAST DOOR AND FRAME

SCALE $\frac{1}{4}$"=1'-0"

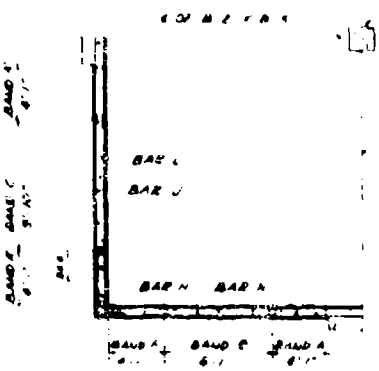


SECTION D-D

SCALE $\frac{1}{4}$"=1'-0"

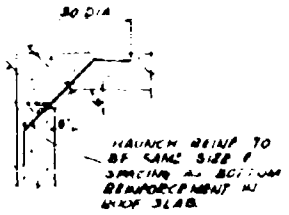


WALL DETAIL



DETAIL b-b

SCALE $\frac{3}{16}$"=1'-0"



DETAIL a-a

SCALE $\frac{1}{2}$"=1'-0"

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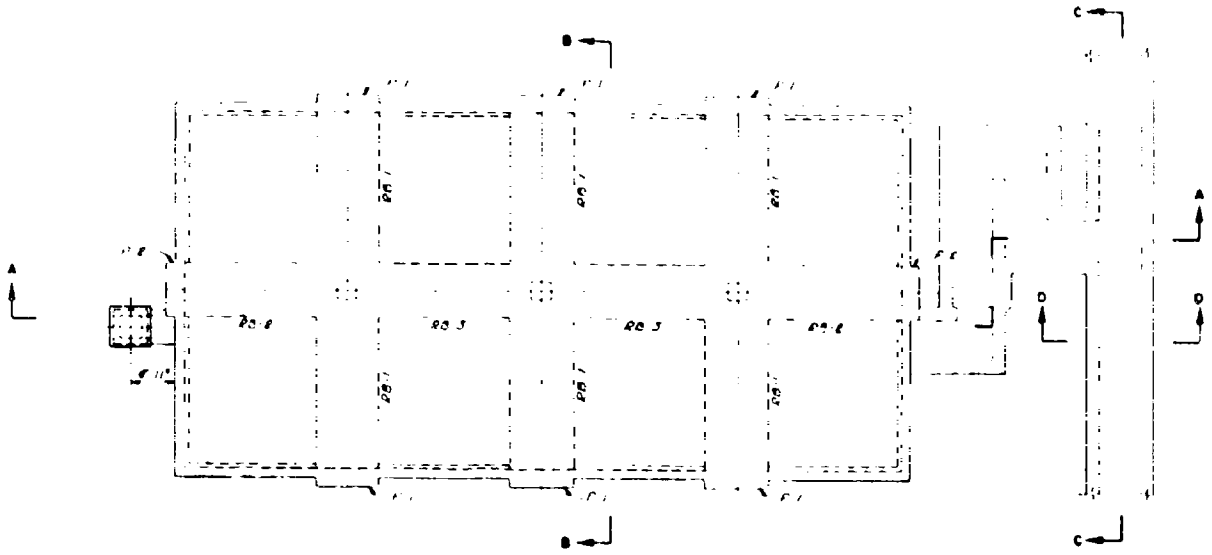
MILITARY CONSTRUCTION ENGINEERING DIVISION
WASHINGTON, D. C.

PROTECTIVE CONSTRUCTION
GENERAL PURPOSE STRUCTURE
EARTH COVERED, RECTANGULAR
25 PSI BLAST RESISTANT

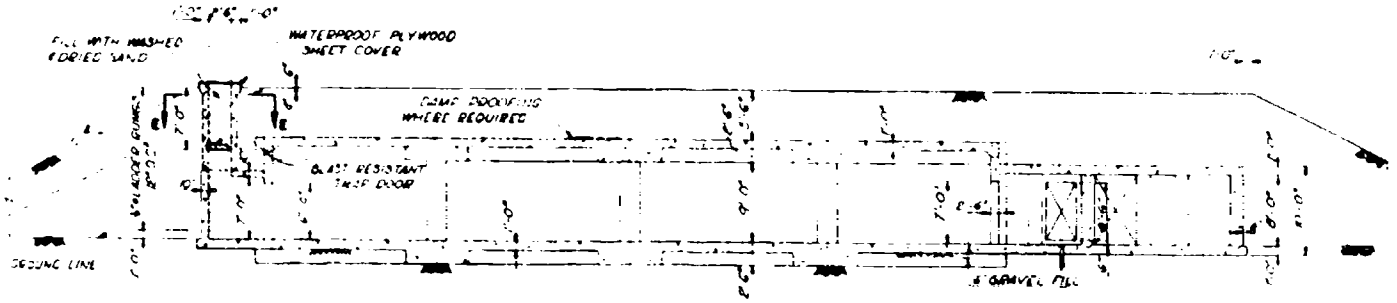
DRAWING NUMBER 60-18-01

SHEET 2 OF 2

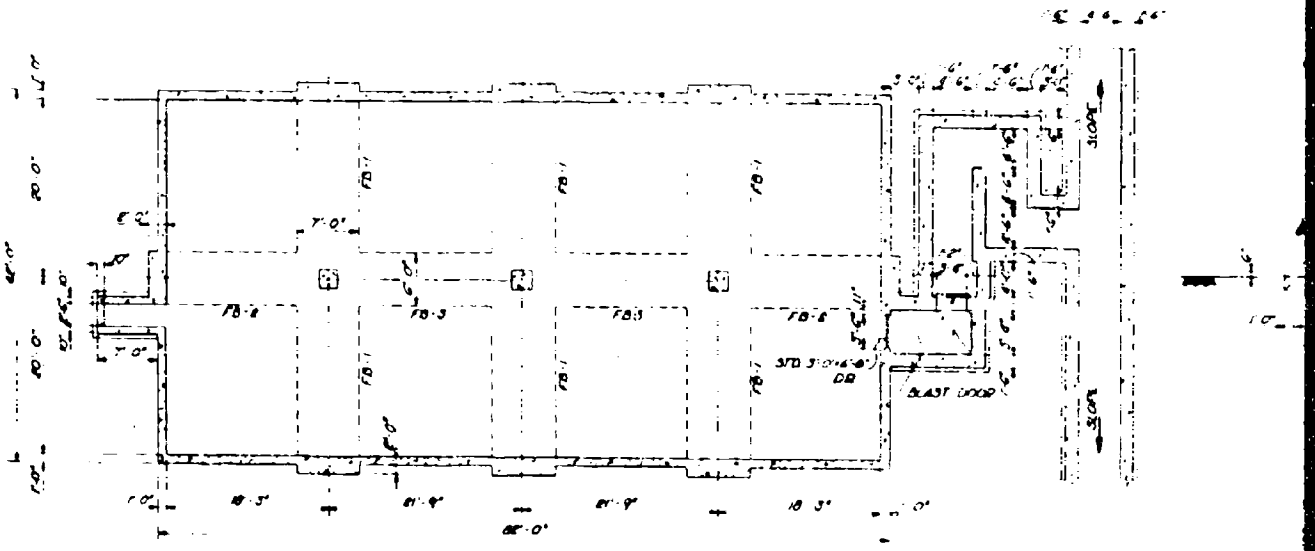
2



ROOF PLAN



SECTION A-A



FLOOR PLAN

DESIGN CONDITIONS

Design Procedure

[illegible]

Design Blast Wave

[illegible]

Blast Loading on Roof

[illegible]

Blast Loading on Walls

[illegible]

Nuclear Radiation Protection for Shelter Area

[illegible]

Strength of Materials

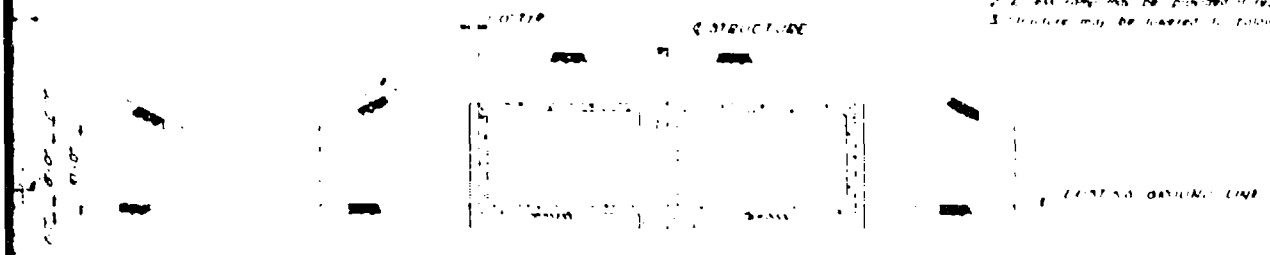
	Static	Blast Design
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]

Allowable Stresses and Deflections

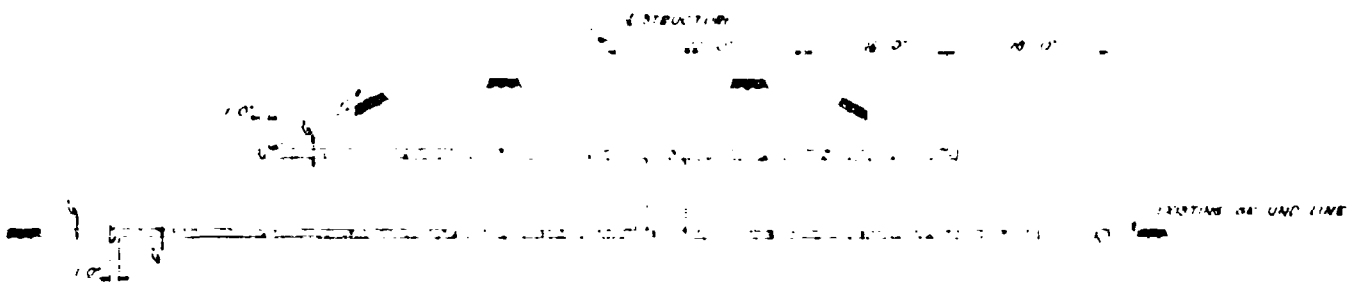
[illegible]

General Notes

[illegible]



SECTION B-B



SECTION C-C

REVISION	DATE	DESCRIPTION	BY	APPROVAL

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CONSULTING ENGINEERS
111 8TH AVENUE, NEW YORK, N.Y.

DEPARTMENT OF THE ARMY
OFFICE OF THE CHIEF OF ENGINEERS
MILITARY CONSTRUCTION ENGINEERING DIVISION
WASHINGTON, D.C.

DRAWN BY FJW

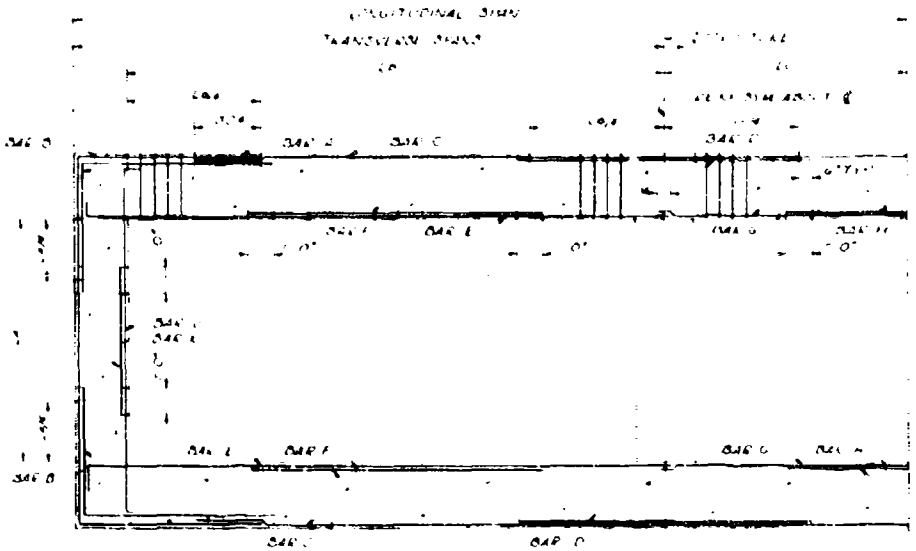
PROTECTIVE CONSTRUCTION
GENERAL PURPOSE STRUCTURE
EARTH COVERED, RECTANGULAR
50 PSI BLAST RESISTANT

SCALE 1" = 1'-0"

DRAWING NUMBER 60-B-01

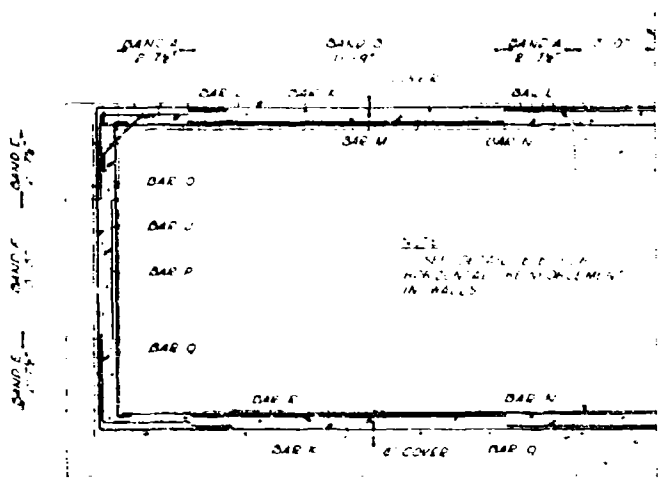
SHEET 1 OF 2

2



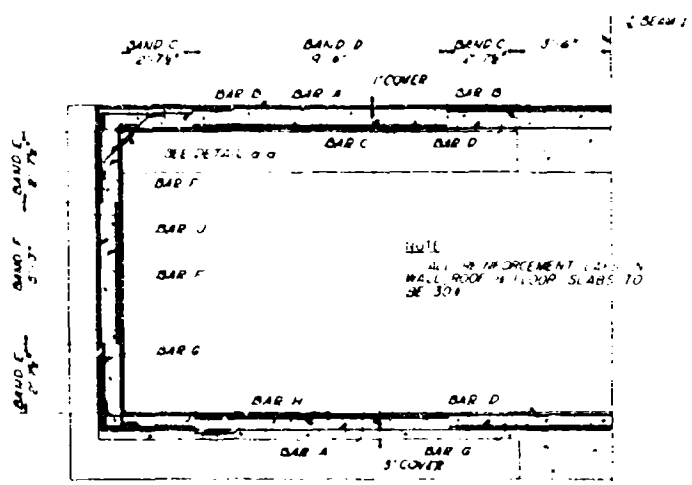
TYPICAL BEAM & PILASTER DETAIL

SCALE 1/8" = 1' 0"



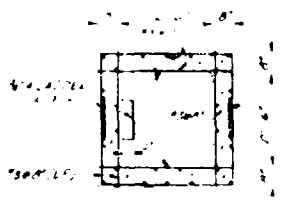
TYPICAL TRANSVERSE SECTION

SCALE 1/8" = 1' 0"



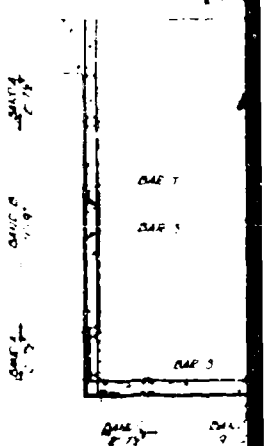
TYPICAL LONGITUDINAL SECTION

SCALE 1/8" = 1' 0"



SECTION E-E

SCALE 1/8" = 1' 0"



DETAIL

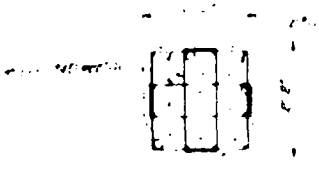
SCALE

ROOF, FLOOR & WALL SLAB SCHEDULE

PANEL	BAND	BAR A	B	C	D	E	F	G	H	J	K	L	M	N	O	P	Q	R	S	T	MAX % STIRRUPS
ROOF	A																				
	B																				
	C																				
	D																				
FLOOR	A																				
	B																				
	C																				
	D																				
FRONT WALL	A																				
	B																				
	E																				
	F																				
SIDE WALL	C																				
	D																				
	E																				
	F																				

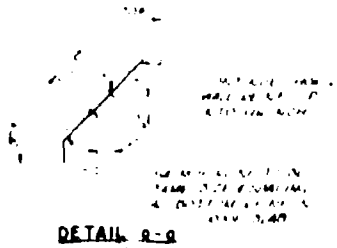
BEAM & PILASTER SCHEDULE

MARK NO	SIZE W	SIZE D	BAR A	B	C	D	E	F	G	H	J	K	MAX % STIRRUPS AT WALL OR ROOF	MAX % STIRRUPS AT COL



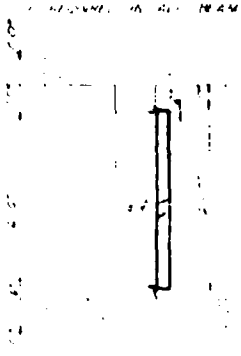
DETAIL OF COLUMN

SCALE 1/4" = 1'-0"



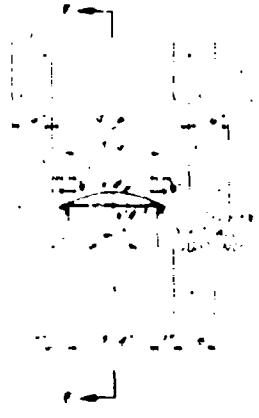
DETAIL B-B

SCALE 1/4" = 1'-0"



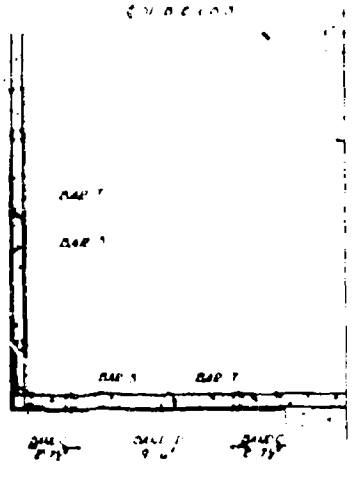
SECTION F-F

SCALE 1/4" = 1'-0"



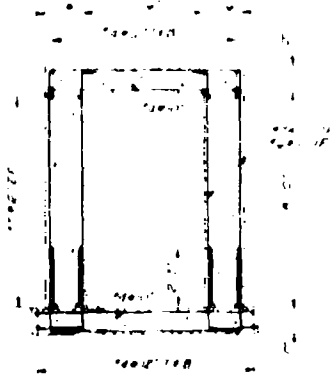
DETAIL OF STEEL BLAST DOOR AND FRAME

SCALE 1/4" = 1'-0"



DETAIL D-D

SCALE 1/4" = 1'-0"



SECTION D-D

SCALE 1/4" = 1'-0"

REVISION	DATE	DESCRIPTION	BY	APPROVED

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CONSULTING ENGINEERS
111 8TH AVENUE, NEW YORK, N.Y.

DEPARTMENT OF THE ARMY
OFFICE OF THE CHIEF OF ENGINEERS
MILITARY CONSTRUCTION ENGINEERING DIVISION
WASHINGTON, D.C.

DRAWN BY: F.J.W.
DESIGNED BY:
CHECKED BY:
SUBMITTED:
APPROVED:

PROTECTIVE CONSTRUCTION
GENERAL PURPOSE STRUCTURE
EARTH COVERED, RECTANGULAR
60 PSI BLAST RESISTANT

ENGINEER: L.J.W.

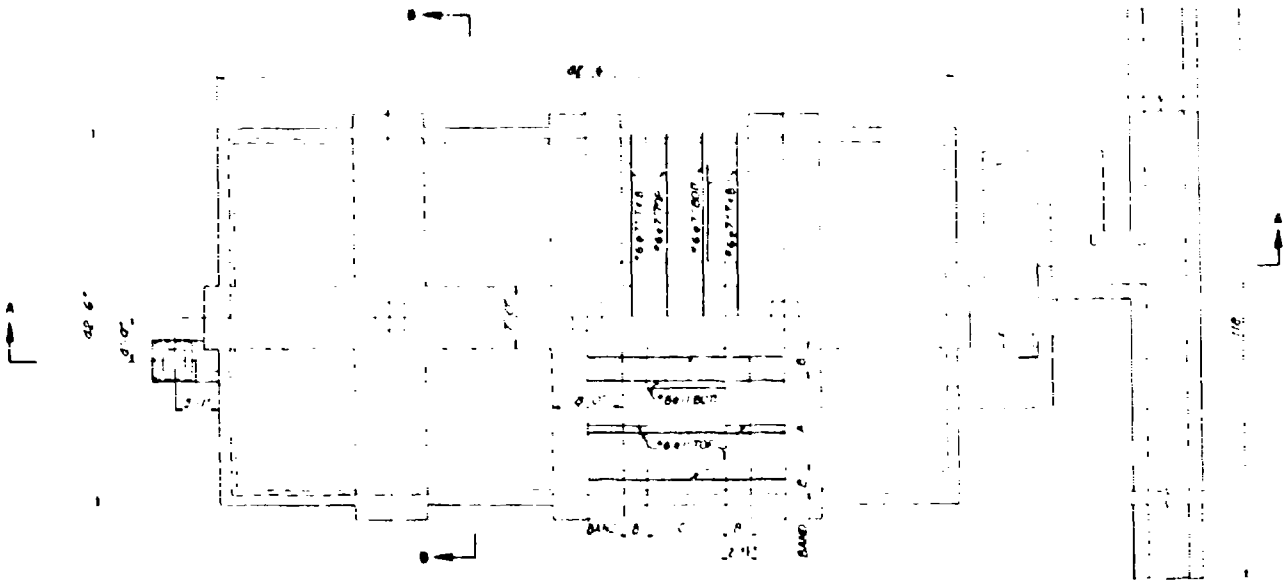
SCALE: AS NOTED

DRAWING NUMBER: 60-18-01

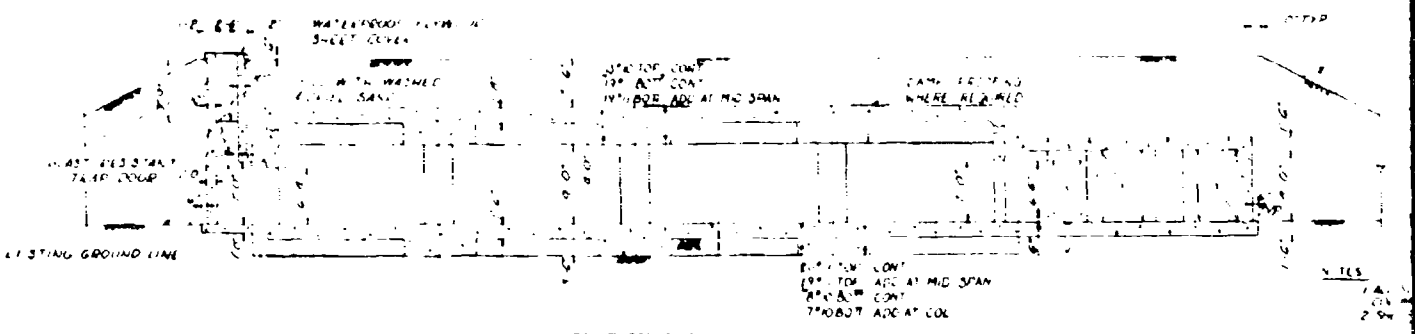
SHEET 2 OF 2

DATE: MAY 1960

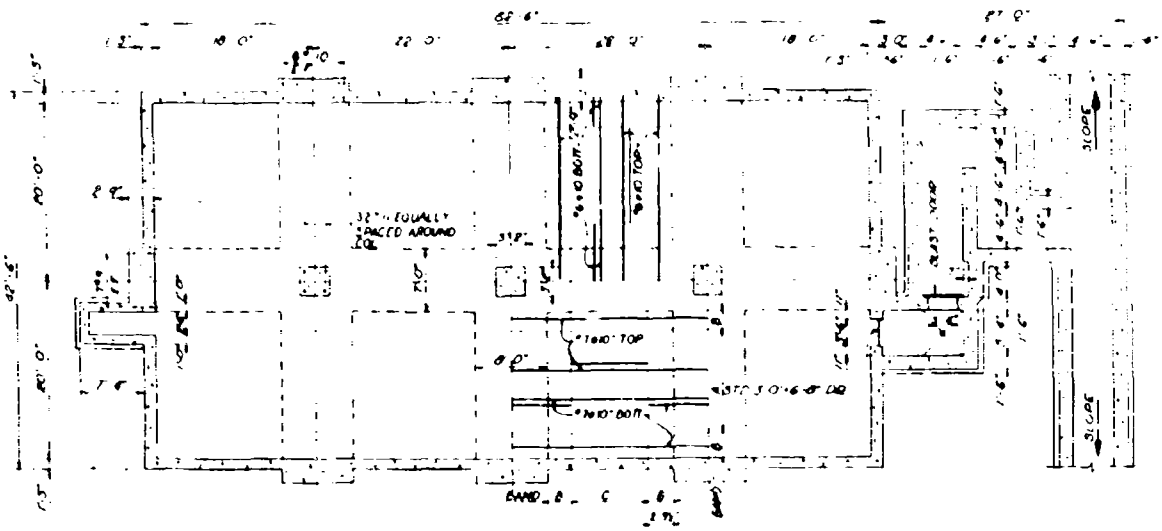
2



ROOF PLAN



SECTION A-A



FLOOR PLAN

DESIGN

Design Procedure

Design Blast Wave

Blast Loading on Roof

Blast Loading on Walls

Nuclear Radiation Protection

Strength of Materials — Static / Blast Design

Allowable Stresses and Deflection

General Notes

1. Blast Slab Rebar Lap About
2. Rebar Bend Diagrams Not Shown

SECTION B-B

AMMANN & WHITNEY
CONSULTING ENGINEERS
111 8TH AVENUE, NEW YORK, N.Y.

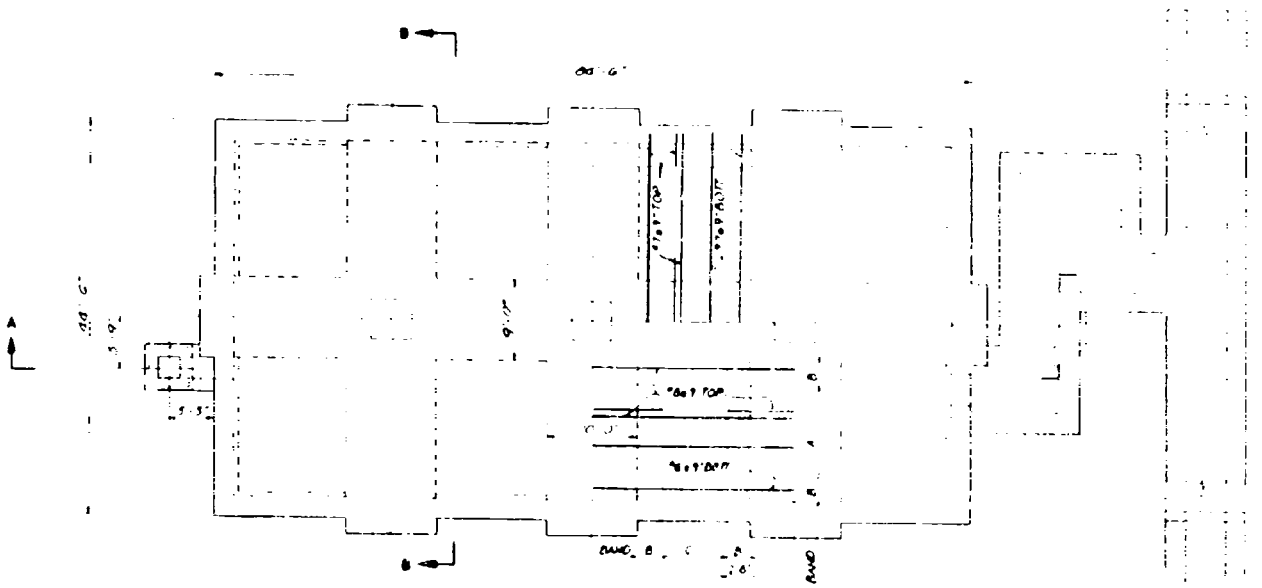
DESIGNED BY
DRAWN BY
CHECKED BY N.D.
TRACED BY
SUBMITTED BY
APPROVED BY
DATE

DEPARTMENT OF THE ARMY
OFFICE OF THE CHIEF OF ENGINEERS
MILITARY CONSTRUCTION ENGINEERING DIVISION

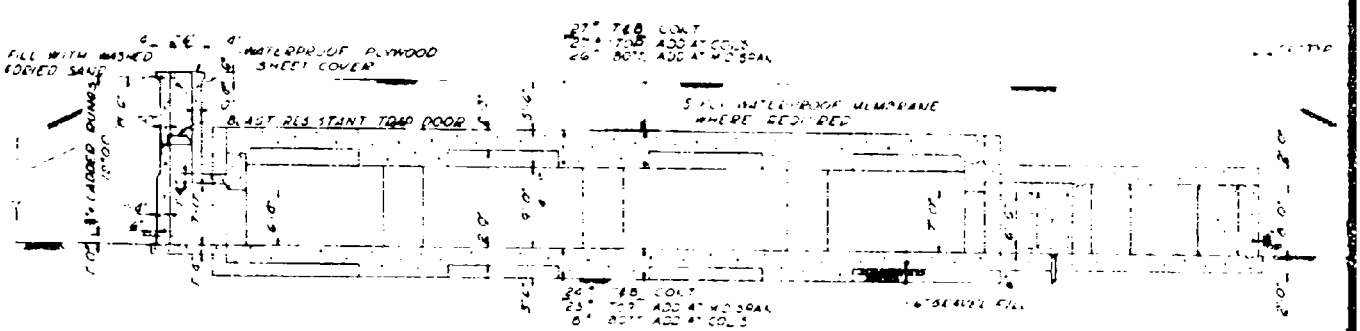
PROTE VE CONSTRU ION
GENERA URPOSE STR CTURE
EARTH C ERED, RECTA ULAR
100 P BLAST RESIS T

DRAWING NO. 60-10
SHEET 1 OF 1

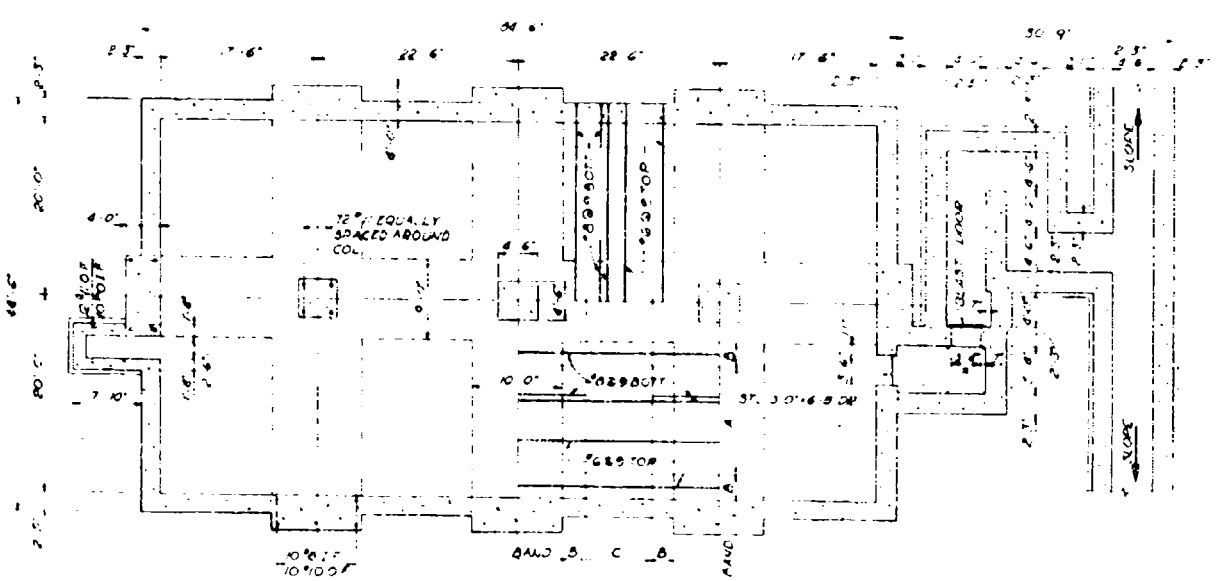
2



ROOF PLAN



SECTION A-A



FLOOR PLAN

DESIGN CONDITIONS

Design Procedure

Design Blast Wave

Blast Loading on Roof

Blast Loading on Walls

Nuclear Radiation Protection for Shelter Area

Strength of Materials

	Statics	Blast Design

Allowable Stresses and Deflections

General Notes

SECTION A-A

REVISION	DATE	DESCRIPTION	BY

AMMANN & WHITNEY
CONSULTING ENGINEERS
111 8TH AVENUE, NEW YORK, N.Y.

DEPARTMENT OF THE ARMY
OFFICE OF THE CHIEF OF ENGINEERS
MILITARY CONSTRUCTION ENGINEERING DIVISION
WASHINGTON, D.C.

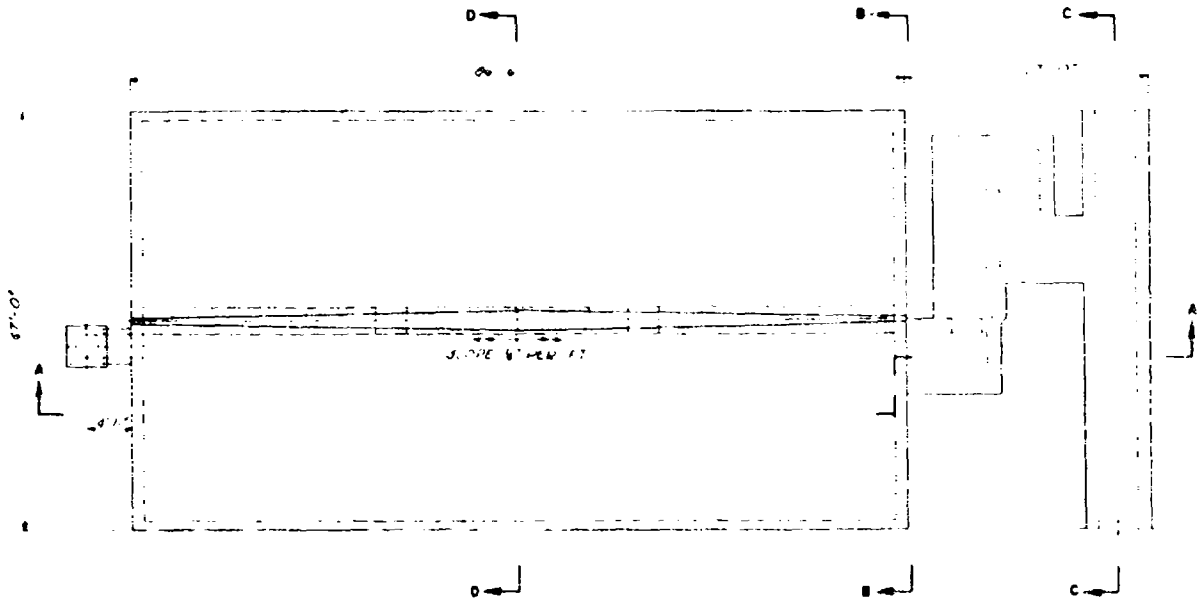
DESIGNED BY
DRAWN BY
CHECKED BY
SUBMITTED BY
APPROVED BY

PROTECTIVE CONSTRUCTION
GENERAL PURPOSE STRUCTURE
EARTH COVERED, RECTANGULAR
200 PSI BLAST RESISTANT

DATE

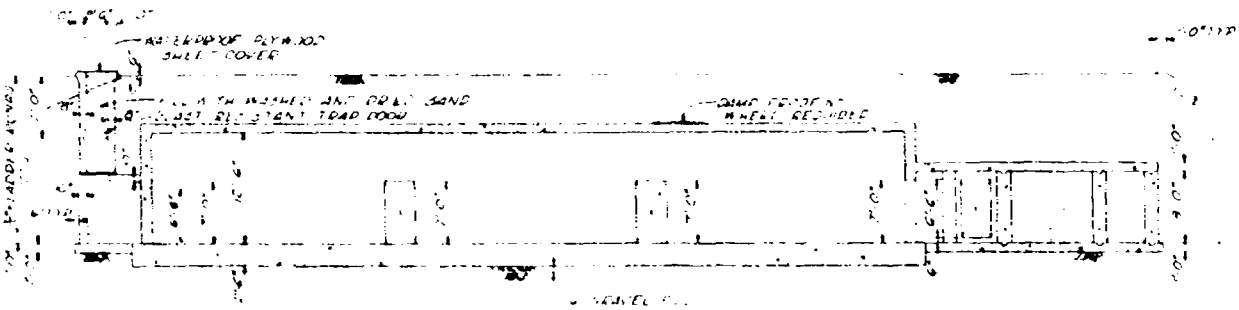
DRAWING NO. 60-10-01

SHEET 1 OF 1



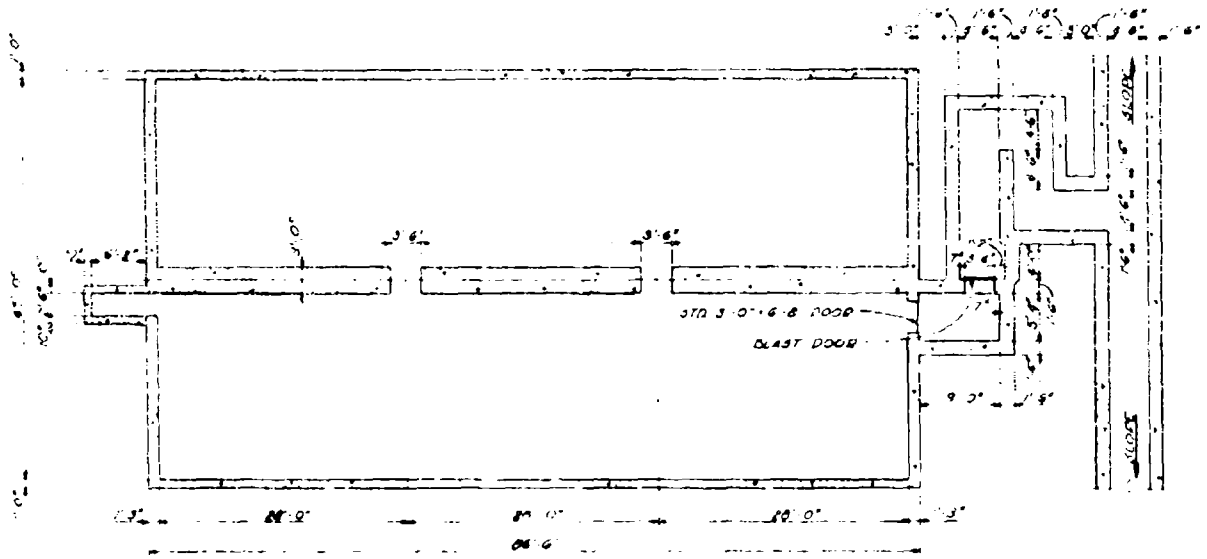
ROOF PLAN

SCALE $\frac{1}{8}$" = 1'-0"



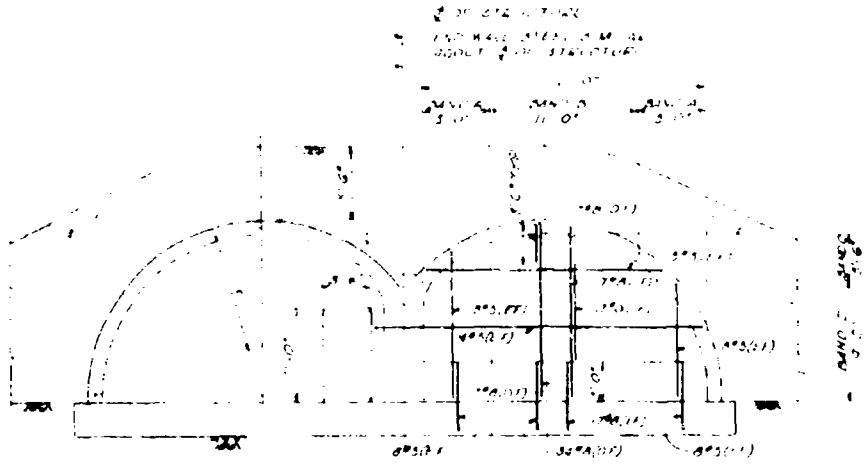
SECTION A-A

SCALE $\frac{1}{8}$" = 1'-0"



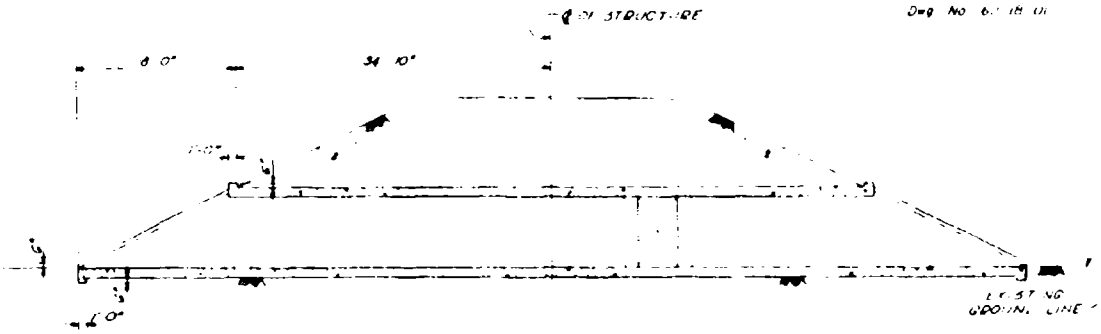
FLOOR PLAN

SCALE $\frac{1}{8}$" = 1'-0"



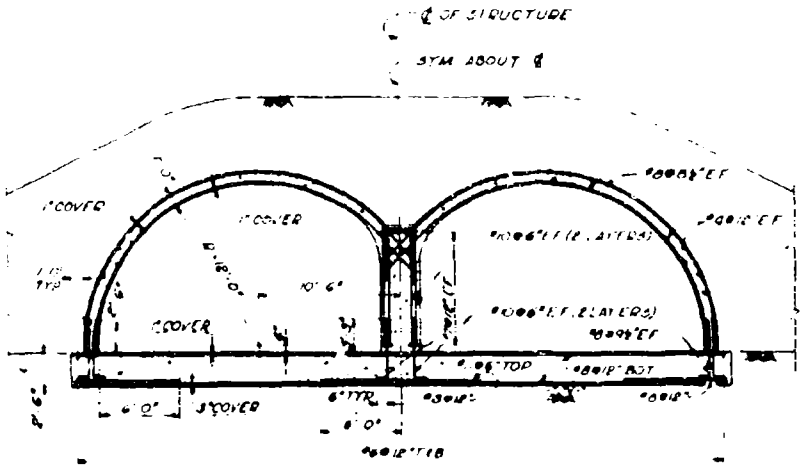
SECTION B-B

SCALE $\frac{3}{16}$" = 1'-0"



SECTION C-C

SCALE $\frac{1}{8}$" = 1'-0"



SECTION D-D

SCALE $\frac{1}{8}$" = 1'-0"

DESIGN CONDITIONS

Design Procedure

In accordance with OCE manual, "Design of Structures for Protection from the Effects of Atomic Weapons"

Design Blast Wave

Peak incident pressure = 50psi Duration = 0.89sec

Blast Loading on Arch Surface

Peak pressure = 80 psi

Nuclear Radiation Protection

Total gamma and neutrons attenuated to 50r for a 100KT weapon at any position which will produce a peak blast pressure equal to 50psi

Strength of Materials

	Static	Blast Design
Soil bearing capacity	8,000psf *	16,000psf
Concrete f_c'	3,000psi	6,500psi
Reinf Steel, lower yield (Int Grade, ASTM A305 50T)	47,500psi	52,000psi
Structural steel, lower yield (ASTM A7-50)	[illegible]	41,800psi

* rated capacity of soil

Allowable Stresses and Deflections

The foundation, end walls and entrance way designed for plastic deformation under design blast load. Arch designed for a maximum tangential deflection equal to h/50 where h is as indicated in Section B-B. Blast door and escape hatch door designed for maximum elastic deformation under design blast load

General Notes

1. The following features are not shown and shall be determined to suit use requirements

   interior partitions
   Mechanical and electrical equipment
   air locks and decontamination facilities

2. Access ramp may be provided if required for vehicles
3. Structure may be lowered to balance cut and fill if desired
4. For entrance way and escape hatch reinforcement and blast door details see Earth Covered Rectangular 5 psi Structure Dwg No 60-18-01

REVISION	DATE	DESCRIPTION	BY	APPROVAL

AMMANN & WHITNEY
CONSULTING ENGINEERS
111-8TH AVENUE, NEW YORK, N.Y.

DEPARTMENT OF THE ARMY
OFFICE OF THE CHIEF OF ENGINEERS
MILITARY CONSTRUCTION ENGINEERING DIVISION
WASHINGTON, D.C.

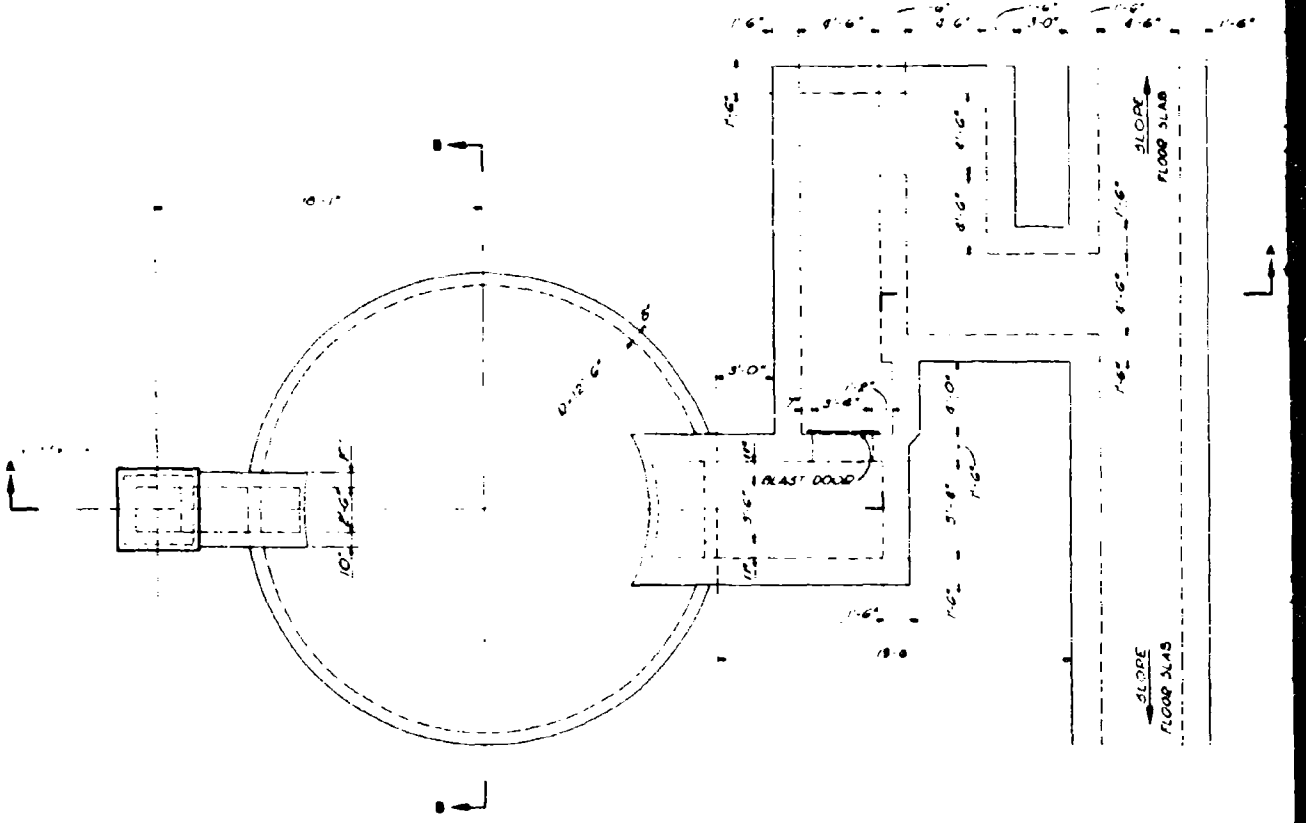
DESIGN BY FJW

PROTECTIVE CONSTRUCTION
GENERAL PURPOSE STRUCTURE
EARTH COVERED
DOUBLE BARREL ARCH
50 PSI BLAST RESISTANT

SCALE AS NOTED

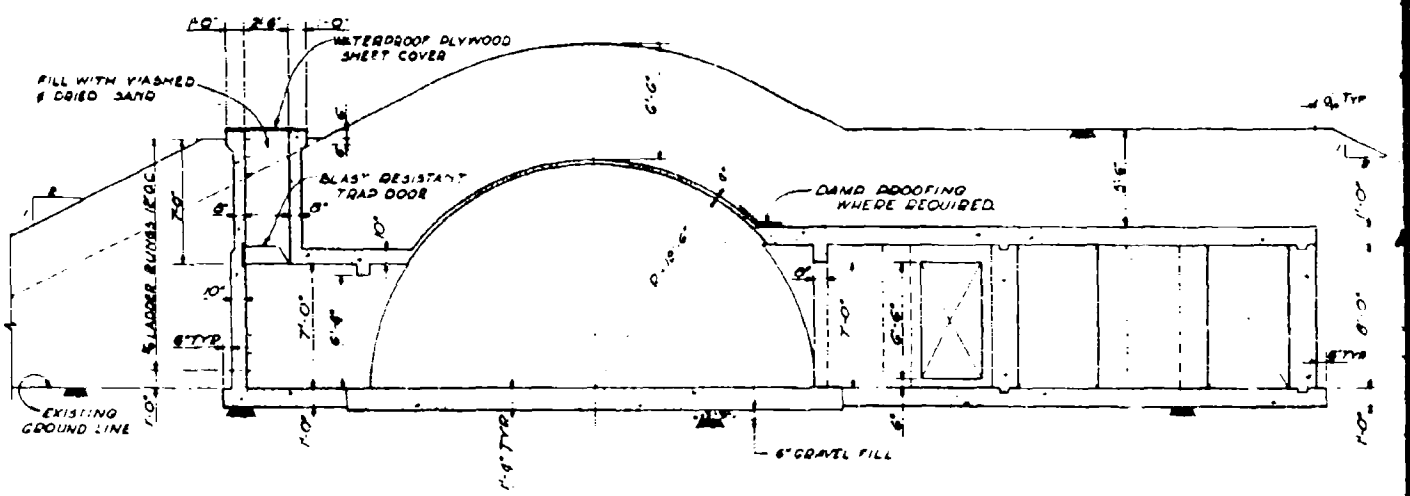
DRAWING NUMBER 60-18-02

SHEET 1 OF 1

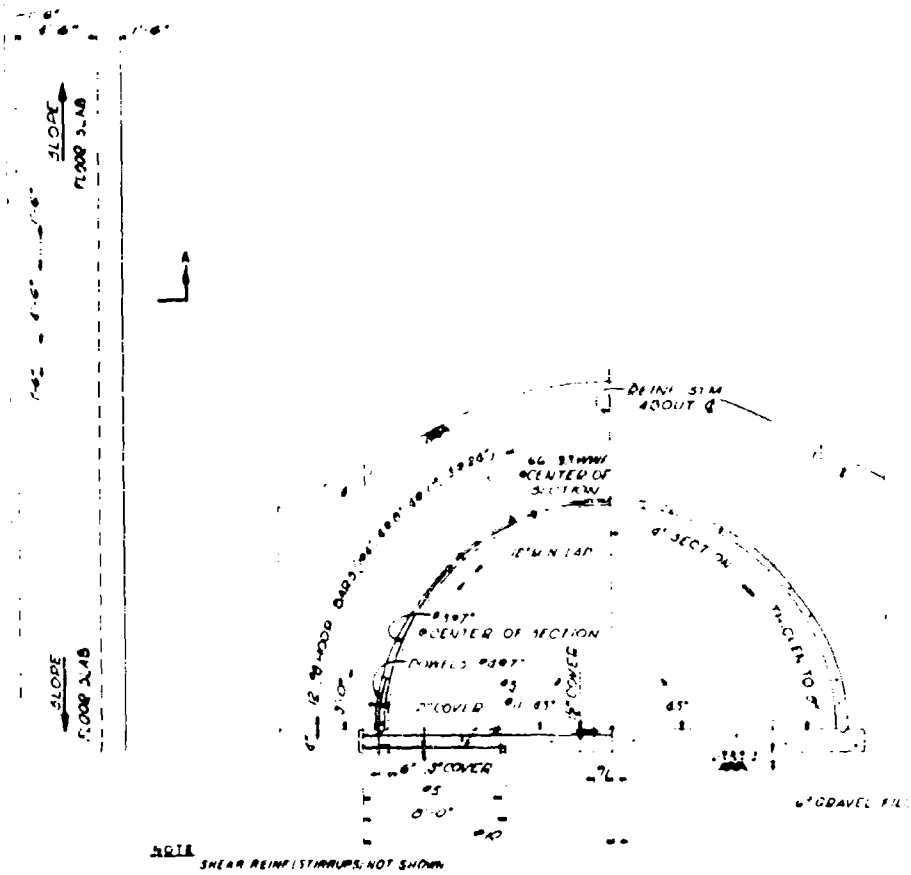


ROOF PLAN

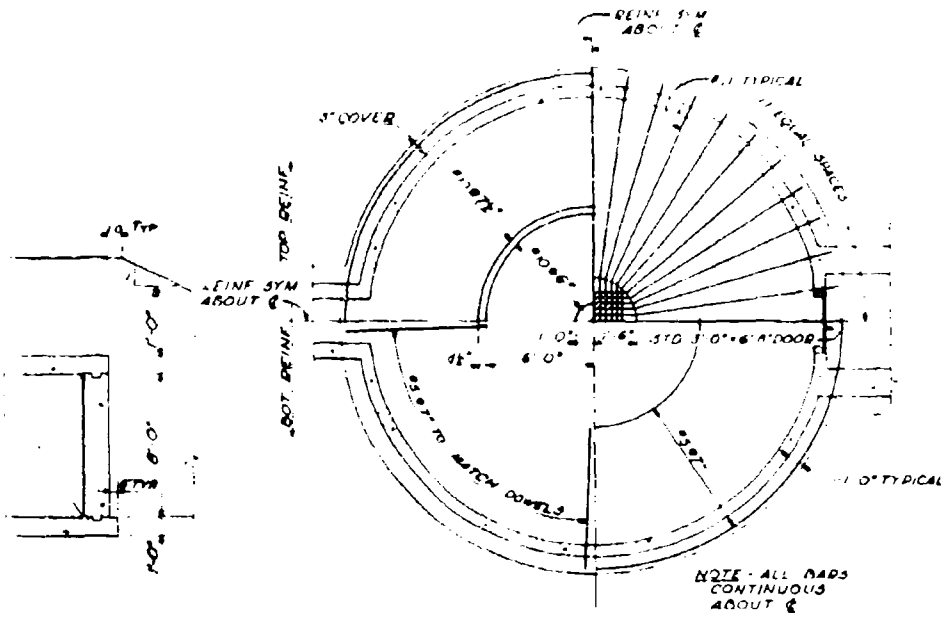
NOTE



SECTION A-A



SECTION B-B



FLOOR SLAB AND FOUNDATION PLAN

DESIGN CONDITIONS

Design Procedure

In accordance with OCE manual, "Design of Structures for Protection from the Effects of Atomic Weapons"

Design Blast Wave

Peak incident pressure = 50psi Duration = 0.85sec

Blast Loading on Dome Surface

Peak pressure = 60psi

Nuclear Radiation Protection

Total gamma and neutrons attenuated to 50r for a 100KT weapon at any [illegible] which will produce a peak blast pressure equal to 50psi

Strength of Materials	Static	Blast Design
Soil bearing capacity	8,000psf*	16,000psf
Concrete		
Dome	3,000psi	3,900psi
Remainder of Structure	3,000psi	6,500psi
Reinf. Steel (lower yield) (Hot Grade, ASTM A305-50T)	47,500psi	52,000psi
Structural steel (lower yield) (ASTM A7-50)	38,000psi	41,600psi

*rated capacity of soil

Allowable Stresses and Deflections

The foundation and entrance way designed for plastic deformation under design blast load. Dome, blast door and escape hatch door designed for maximum elastic deformation under design blast load

General Notes

1. The following features are not shown and shall be determined to suit use requirements:
   - Interior partitions
   - Heating and electrical equipment
   - Air locks and decontamination facilities
2. Access ramp may be provided if required for vehicles
3. Floor may be lowered to provide cut and fill if desired
4. For entrance way and escape hatch reinforcement, and blast door details see Earth Cov'd Rectangular Steel Structure Dwg No 60-18-01

REVISION	DATE	DESCRIPTION	BY	APPROVAL

AMMANN & WHITNEY
CONSULTING ENGINEERS
111 8TH AVENUE, NEW YORK, N. Y.

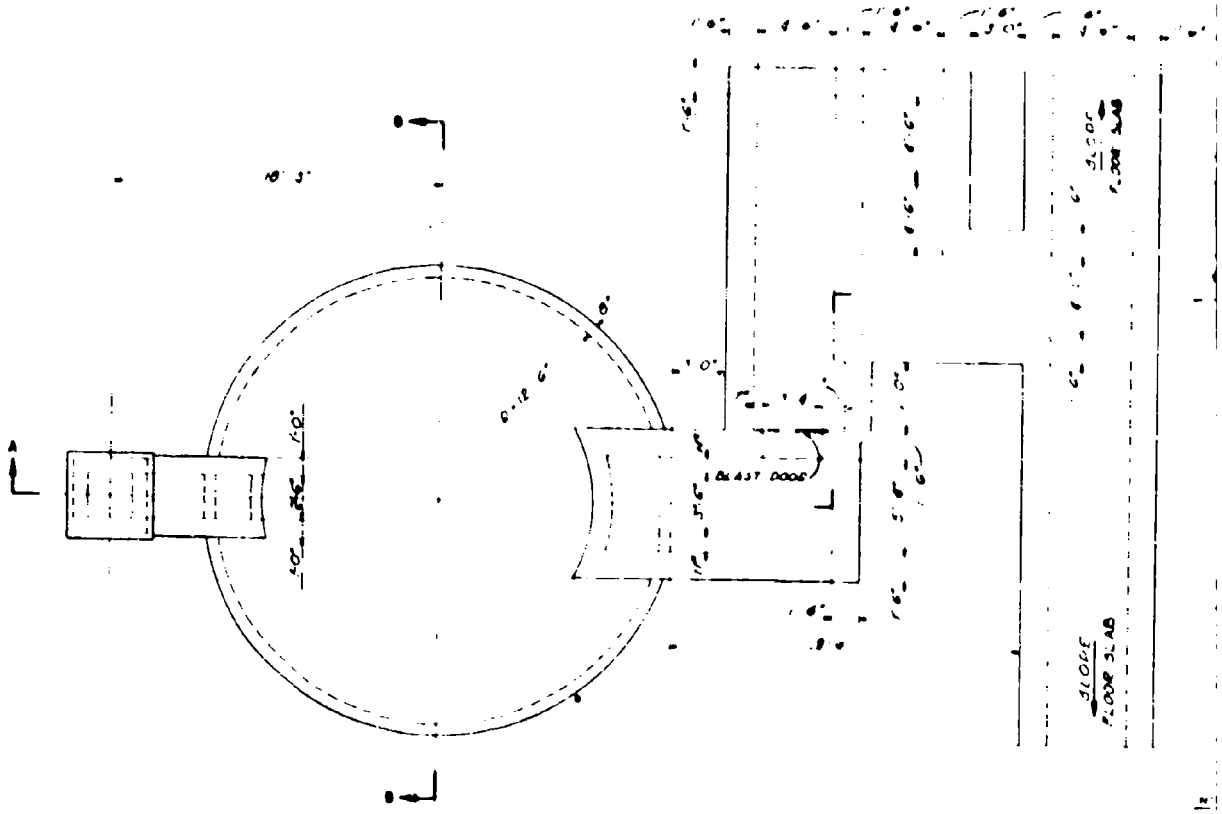
DEPARTMENT OF THE ARMY
OFFICE OF THE CHIEF OF ENGINEERS
MILITARY CONSTRUCTION ENGINEERING DIVISION
WASHINGTON, D. C.

DESIGNED BY F.J.W.
DRAWN BY
CHECKED BY E.L.
APPROVED

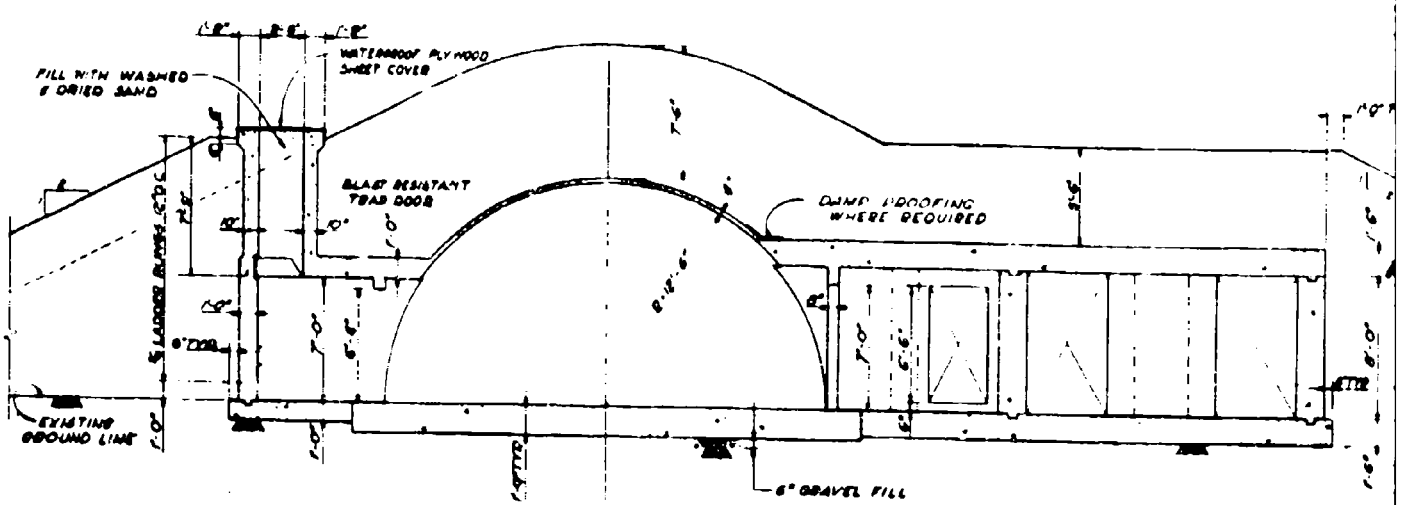
PROTECTIVE CONSTRUCTION
GENERAL PURPOSE STRUCTURE
EARTH COVERED DOME
50 PSI BLAST RESISTANT

SCALE 1/4"=1'-0"
DRAWING NUMBER 60-18-03
SHEET 1 OF 1

2



ROOF PLAN



SECTION A-A

DESIGN CONDITIONS

Design Procedure

In accordance with OCE manual, "Design of Structures for Protection from the Effects of Atomic Weapons"

Design Blast Wave

Peak incident pressure = 100psi Duration = 0.64 sec

Blast Loading on Dome Surface

Peak pressure = 155psi

Nuclear Radiation Protection

Total gamma and neutron attenuated to 50r for a 200KT weapon at any position which will produce a peak blast pressure equal to 100psi.

Strength of Materials	Static	Blast Design
Soil bearing capacity	8,000psf *	16,000psf
Concrete f'c		
Dome	4,000psi	5,200psi
Remainder of Structure	3,000psi	6,500psi
Reinf. Steel, lower yield (Int Grade, ASTM A305-50T)	41,500psi	58,000psi
Structural steel, lower yield (ASTM A7-50)	38,000psi	41,600psi

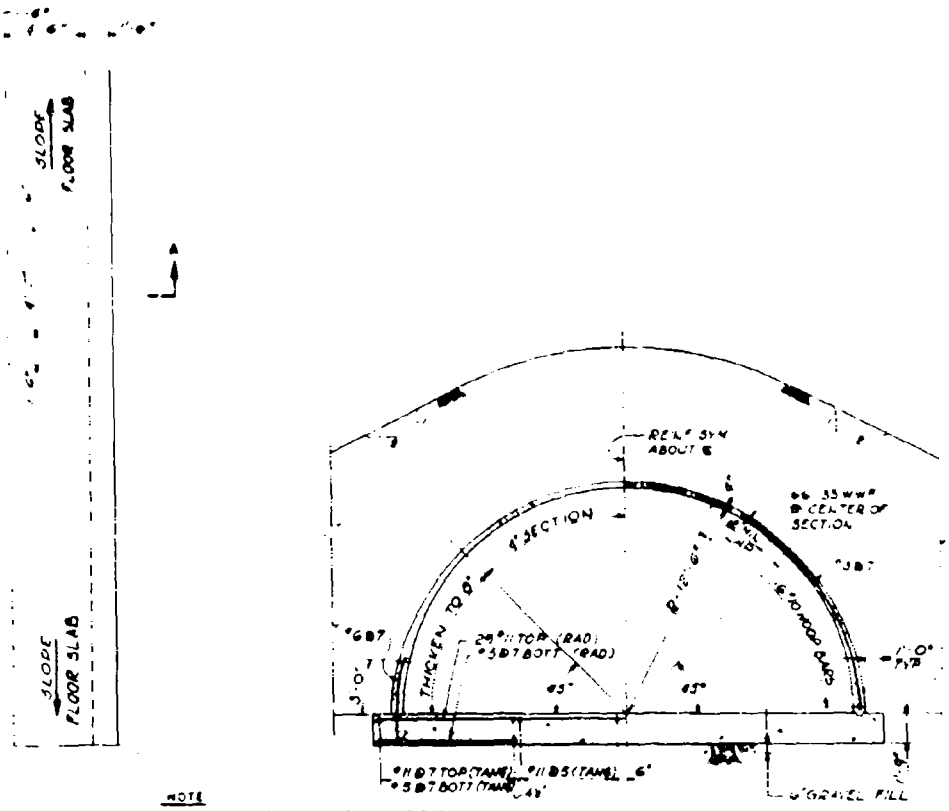
* rated capacity of soil

Allowable Stresses and Deflections

The foundation and entrance way designed for plastic deformation under design blast load. Dome, blast door and shape hatch door designed for maximum elastic deformation under design blast load

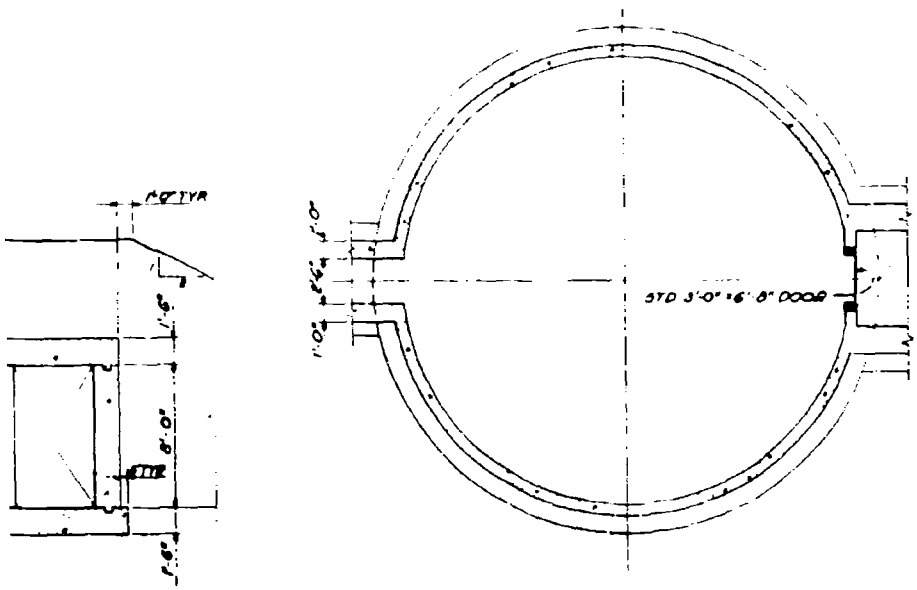
General Notes

1. The following features are not shown and shall be determined to suit use requirements
   - Interior partitions
   - Mechanical and electrical equipment
   - Air locks and decontamination facilities
2. Access ramp may be provided if required for vehicles.
3. Thermal protection to be applied to all exterior doors
4. Structure may be lowered to balance cut and fill if desired



NOTE
SHEAR REINF (STIRRUPS) NOT SHOWN

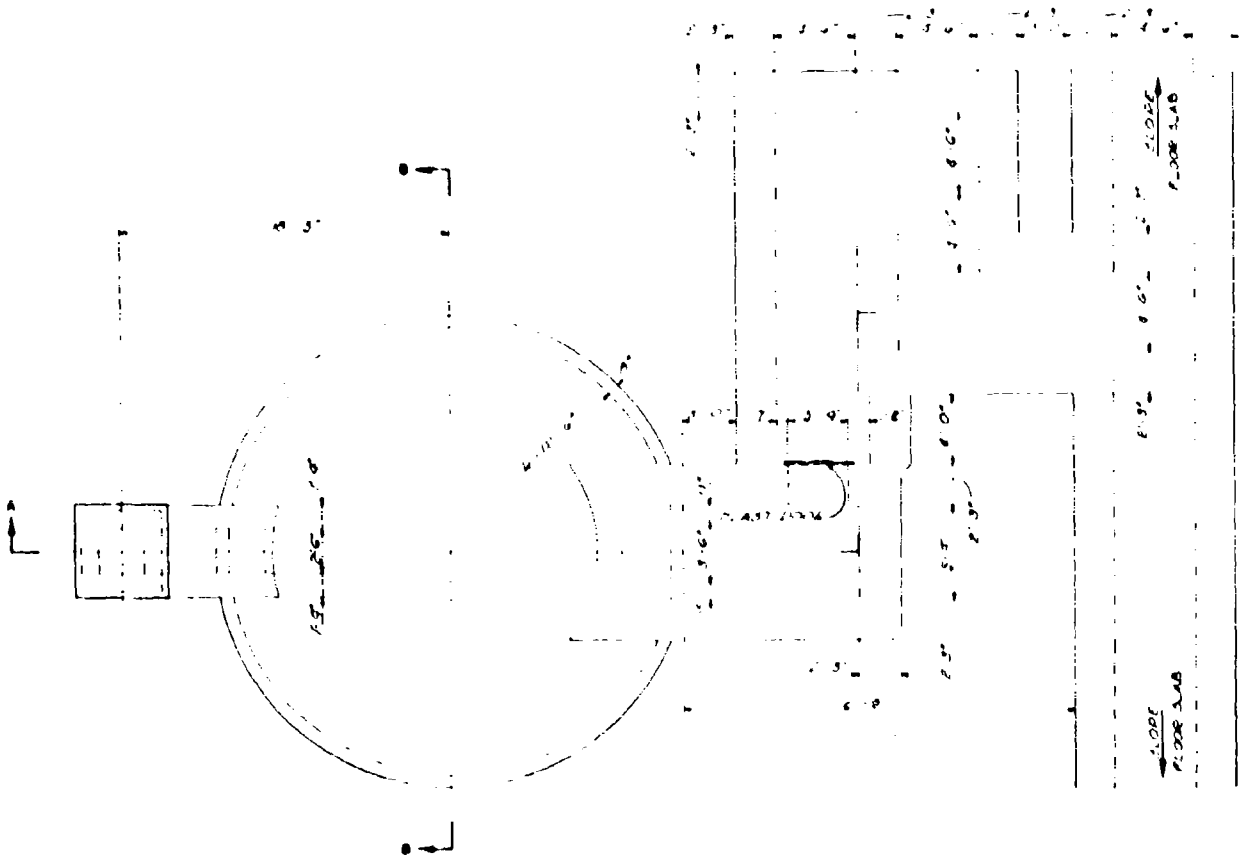
SECTION B-B



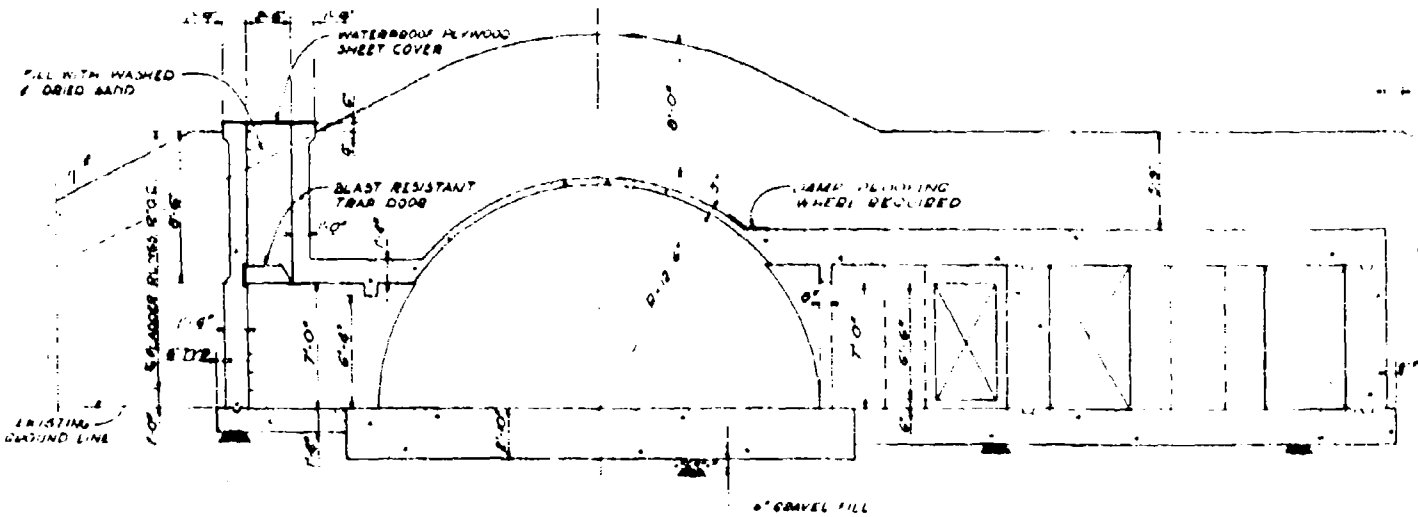
FLOOR SLAB AND FOUNDATION PLAN

AMMANN & WHITNEY CONSULTING ENGINEERS 111-8TH AVENUE, NEW YORK, N. Y.	DEPARTMENT OF THE ARMY OFFICE OF THE CHIEF OF ENGINEERS MILITARY CONSTRUCTION ENGINEERING DIVISION WASHINGTON, D. C.		
DRAWN BY FJW	PROTECTIVE CONSTRUCTION GENERAL PURPOSE STRUCTURE EARTH COVERED DOME 100 PSI BLAST RESISTANT		
		1/8"=1'-0"	
		DRAWING NUMBER 60-10-05	
		SHEET 1 OF 1	

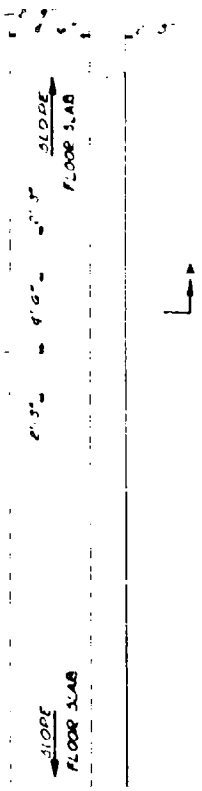
2

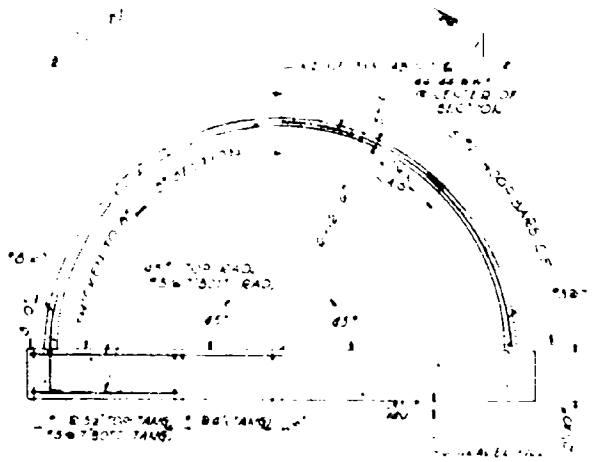


ROOF PLAN



SECTION A-A





NOTE
SHEAR REINFORCING NOT SHOWN

SECTION B-B

DESIGN CONDITIONS

Design Procedure
In accordance with OCE manual "Design of Structures for Protection from the Effects of Atomic Weapons"

Design Blast Wave
Peak incident [illegible] psi Duration [illegible] msec

Blast Loading on Dome Surface
Peak pressure [illegible] psi

Nuclear Radiation Protection
[illegible] gamma and neutrons attenuated to [illegible] rem/hr within [illegible] of any location which will produce a peak [illegible] equal to [illegible] psi

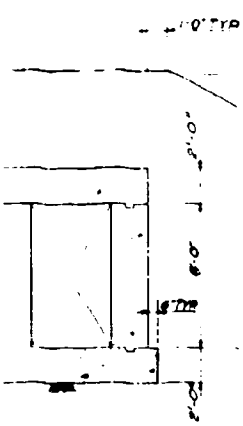
Strength of Materials

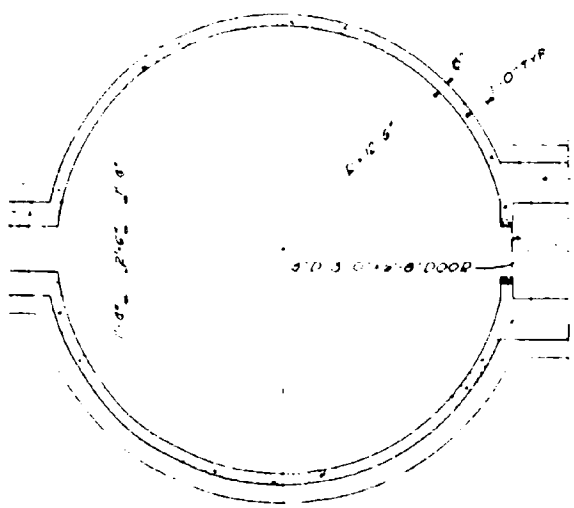
	Static	Blast Design
[illegible] bearing capacity	[illegible]*	[illegible] psf
Concrete	[illegible]	[illegible] psi
Rebar Steel (see [illegible] grade, A 615, 50T)	[illegible]	[illegible]
Structural Steel (see [illegible] grade, A 36, 50T)	[illegible]	[illegible]

*Ultimate capacity of soil

Allowable Stresses and Deflections
The foundation and entrance way designed for plastic deformation under design blast load. Dome, blast door and escape hatch door designed for maximum elastic deformation under design blast load

General Notes
1. The following features are not shown and shall be determined to suit use requirements
   - Interior partitions
   - Mechanical and electrical equipment
   - Air locks and decontamination facilities
2. Access ramp may be provided if required for vehicles
3. Thermal protection to be applied to all exterior doors
4. Structure may be lowered to balance cut and fill if desired





FLOOR SLAB AND FOUNDATION PLAN

SYMBOL	DATE	DESCRIPTION	BY	APPROVAL

ANIMANN & WHITNEY
CONSULTING ENGINEERS
111-8th AVENUE, NEW YORK, N. Y.

DEPARTMENT OF THE ARMY
OFFICE OF THE CHIEF OF ENGINEERS
MILITARY CONSTRUCTION ENGINEERING DIVISION
WASHINGTON, D. C.

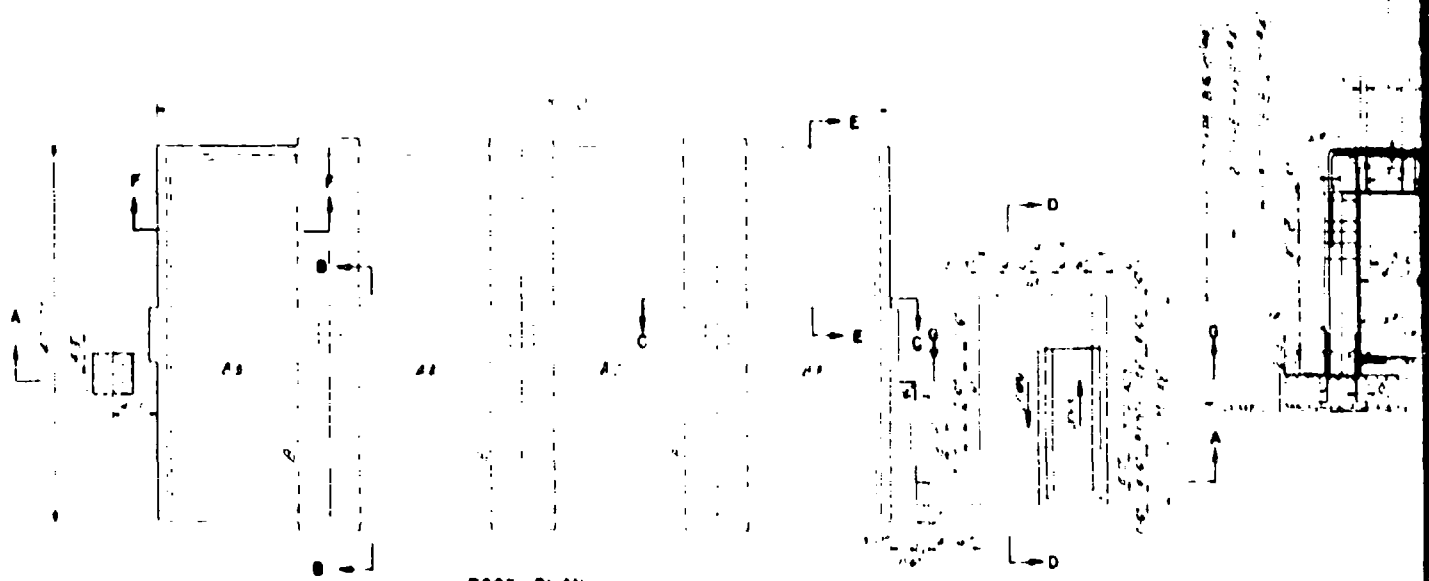
DESIGNED BY F.J.W.
DRAWN BY L.B.
CHECKED BY

PROTECTIVE CONSTRUCTION
GENERAL PURPOSE STRUCTURE
EARTH COVERED DOME
300 PSI BLAST RESISTANT

APPROVED DATE
SCALE 1/4"=1'-0"
DRAWING NUMBER 60-16-03
SHEET 1 OF 1

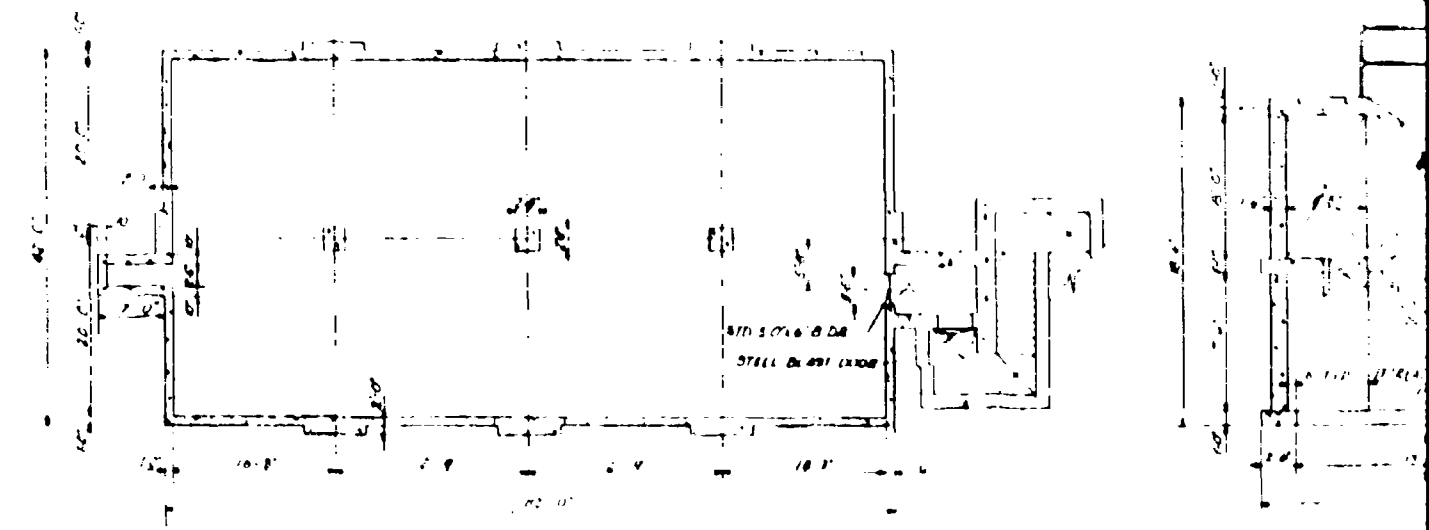
DATE: SEP 1960

2

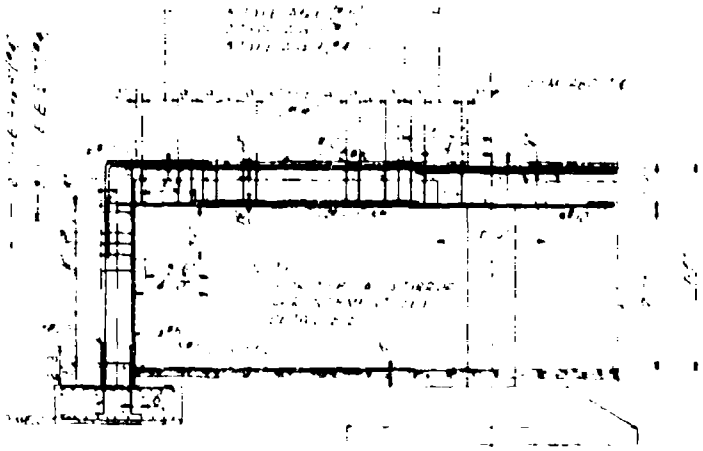


ROOF PLAN
SCALE 1/8" = 1'-0"

SECTION A-A
SCALE 1/8" = 1'-0"



FLOOR PLAN
SCALE 1/8" = 1'-0"



SECTION B-B

SCALE 1/4"=1'-0"

DESIGN CR

Design Procedure

In accordance with (ER manual), the ... protect from the effects of blast weapons.

Design Blast Wave

Peak incident pressure = 50 psi ... = 0.08 sec

Front Loading on Exterior Surface

Peak pressure = 0 psi; Duration ...

Design Radiation Protection

Total gamma and neutron attenuation of any material which will produce ... for a 100MT weapon ... blast pressure equal ... 50 psi

Strengths of Materials

		Blast Design
Soil bearing capacity	psf	10,000 psf
Concrete, f'c	psi	4,000 psi
Rebar, Steel, lower yield	psi	60,000 psi
(for Grade ASTM A615 GRT)		
Structural Steel lower yield (ASTM A7 50)	psi	41,000 psi

* ... capacity of soil

Allowable Stresses and Deflections

Roof and walls designed for plastic ... under design ... Blast doors, escape hatches, etc., design ... elastic ... under design blast load

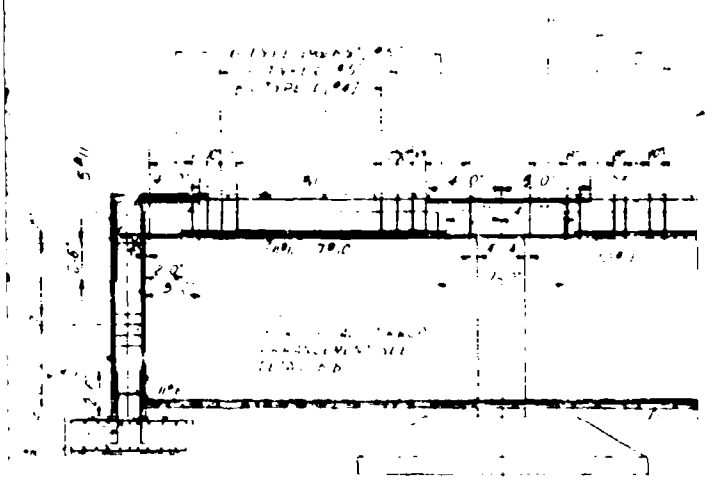
General Notes

1. The following features are ... and shall be determined ... use requirements:

Interior partitions
Mechanical equipment
Air locks and decontamination facilities

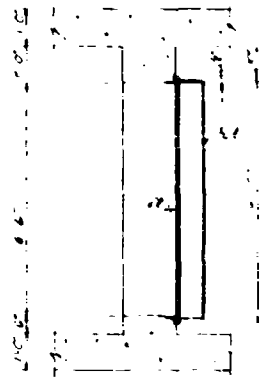
2. Access stairs may be varied as ...

3. Access ramp may be provided if ... for regulations



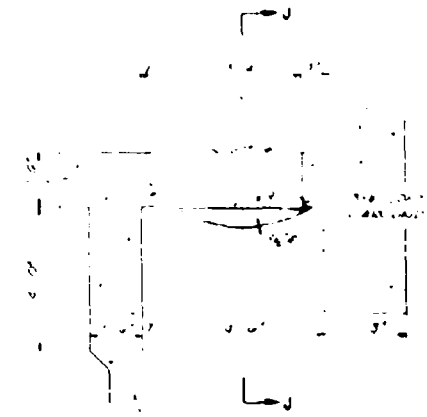
SECTION C-C

SCALE 1/4"=1'-0"



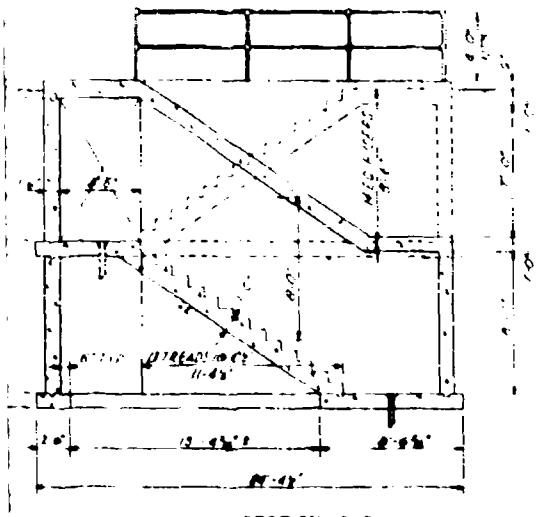
SECTION J-J

SCALE 1/4"=1'-0"



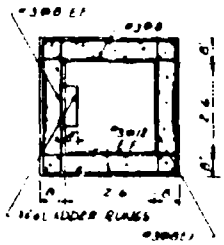
DETAIL OF STEEL BLAST DOOR AND FRAME

SCALE 1/4"=1'-0"



SECTION D-D

NTS



SECTION H-H

SCALE 1/4"=1'-0"

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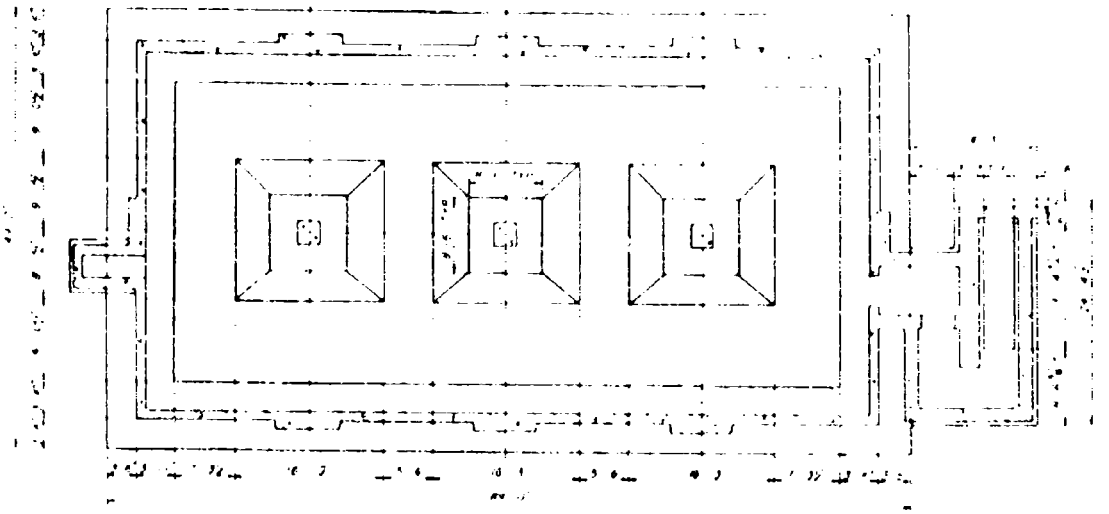
CONSULTING ENGINEERS
111 - 8TH AVENUE, NEW YORK, N.Y.

DEPARTMENT OF THE ARMY
OFFICE OF THE CHIEF OF ENGINEERS
DIVISION
CONSTRUCTION BRANCH
WASHINGTON, D.C.

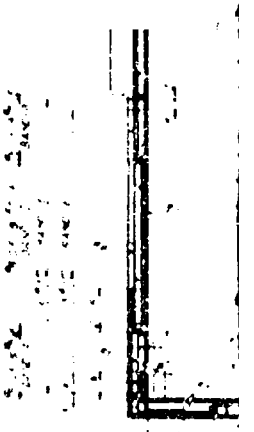
DESIGNED BY J.S.
DRAWN BY
CHECKED BY

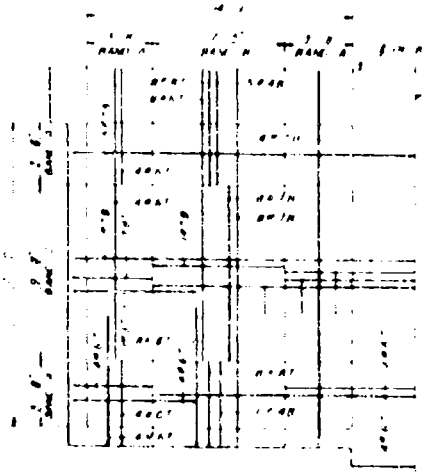
PROTECTIVE CONSTRUCTION
GENERAL PURPOSE STRUCTURE
BURIED RECTANGULAR
50 PSI BLAST RESISTANT

"AS NOTED"
DRAWING NO. 60-10-C4
SHEET 1 OF 2

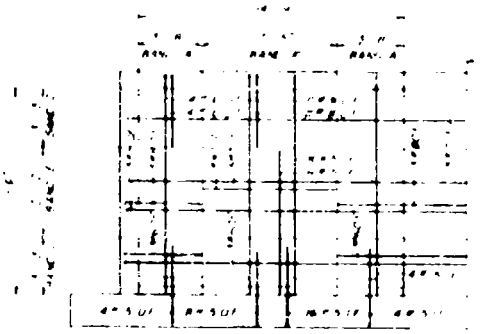


FOUNDATION PLAN

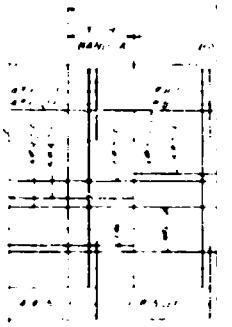


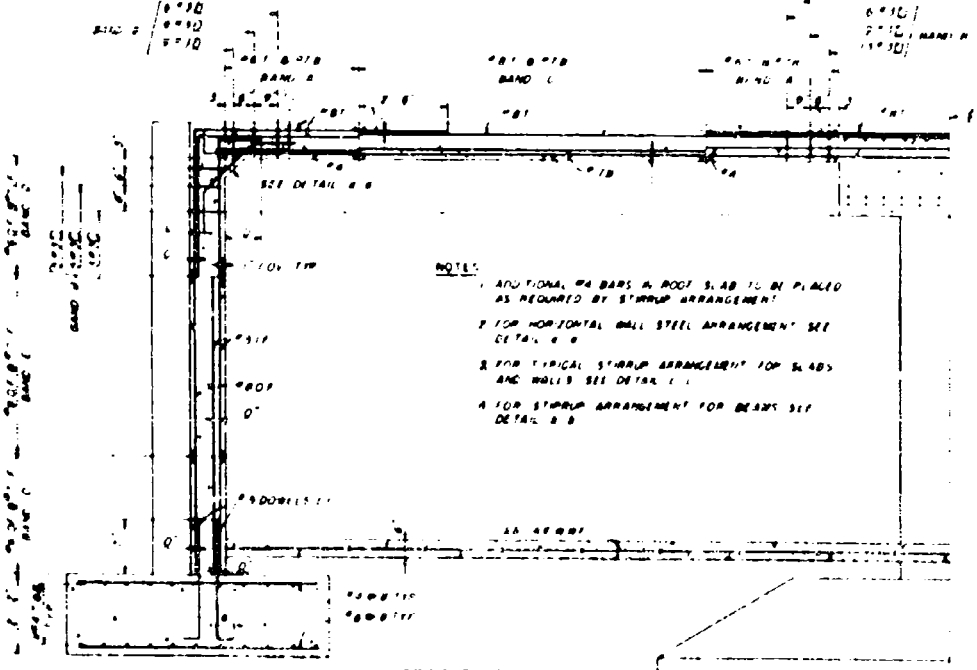


TYPICAL ROOF SLAB

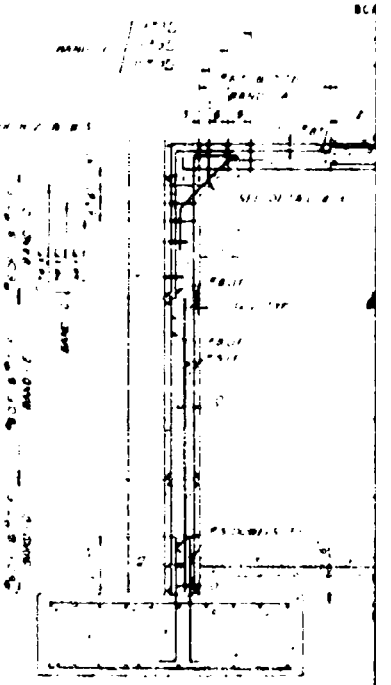


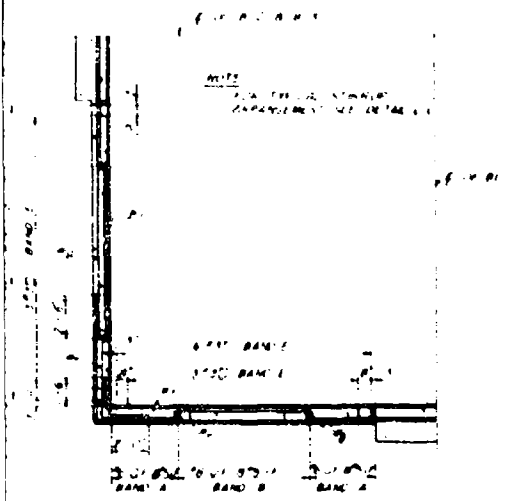
TYPICAL FRONT & REAR WALL



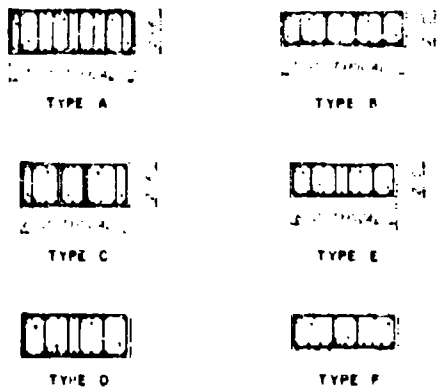


SECTION E-E

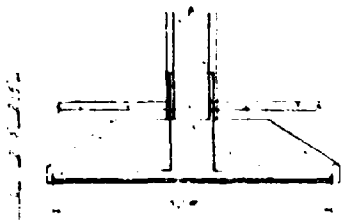




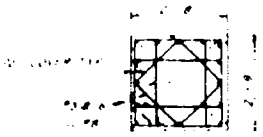
DETAIL a-a
SCALE 1/4"=1'-0"



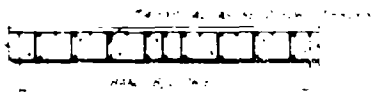
DETAIL b-b
SCALE 1/4"=1'-0"



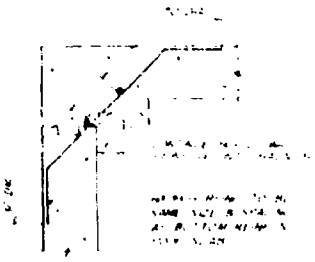
DETAIL OF COLUMN FOOTING
SCALE 1/4"=1'-0"



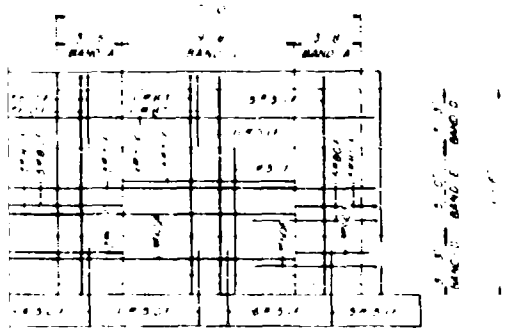
DETAIL OF COLUMN
SCALE 1/4"=1'-0"



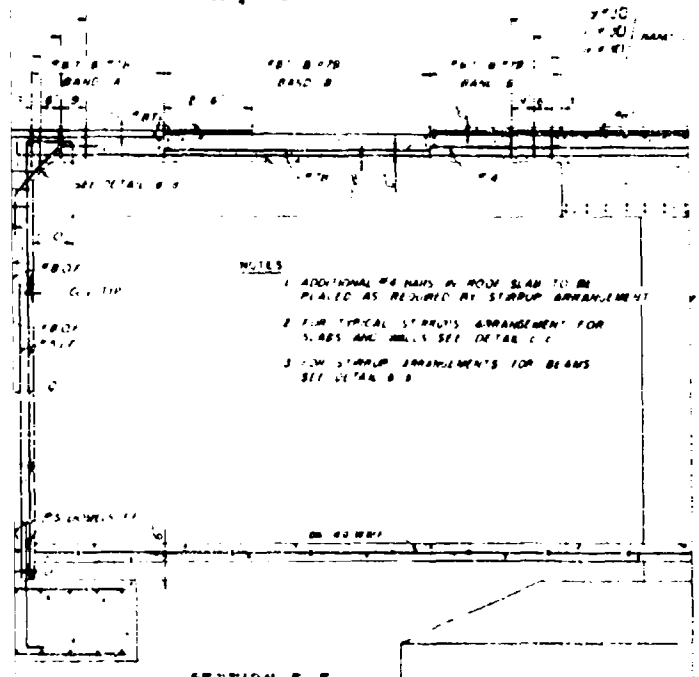
DETAIL c-c
SCALE 1/4"=1'-0"



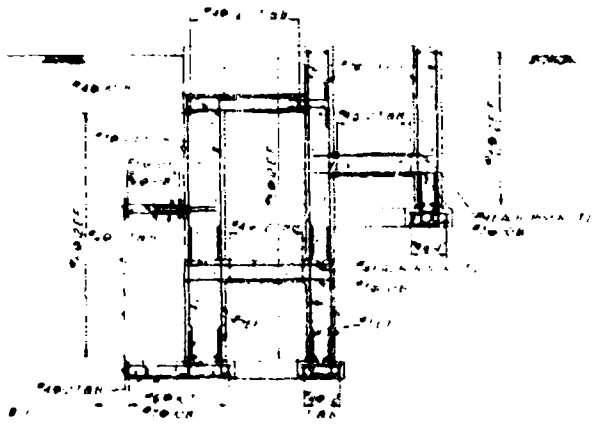
DETAIL d-d
SCALE 1/4"=1'-0"



TYPICAL END WALL
SCALE 1/4"=1'-0"



SECTION F-F
SCALE 1/4"=1'-0"



SECTION G-G
SCALE 1/4"=1'-0"

2

AMMANN & WHITNEY
CONSULTING ENGINEERS
111 8TH AVENUE, NEW YORK, N.Y.

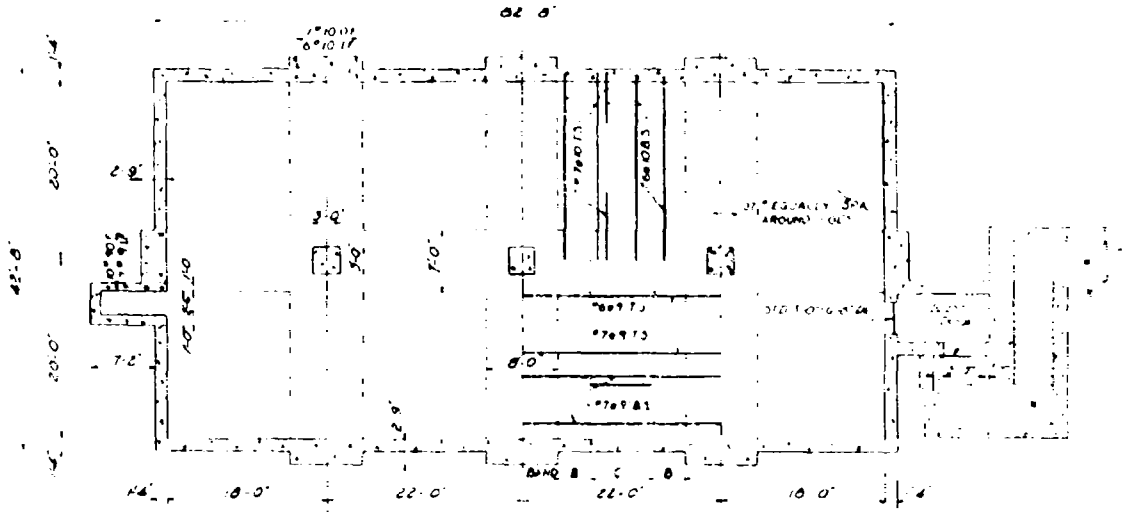
DEPARTMENT OF THE ARMY
OFFICE OF THE CHIEF OF ENGINEERS
MILITARY CONSTRUCTION DIVISION
WASHINGTON, D.C.

DESIGNED BY J.S.
CHECKED BY
DRAWN BY
APPROVED

PROTECTIVE CONSTRUCTION
GENERAL PURPOSE STRUCTURE
BURIED RECTANGULAR
50 PSI BLAST RESISTANT

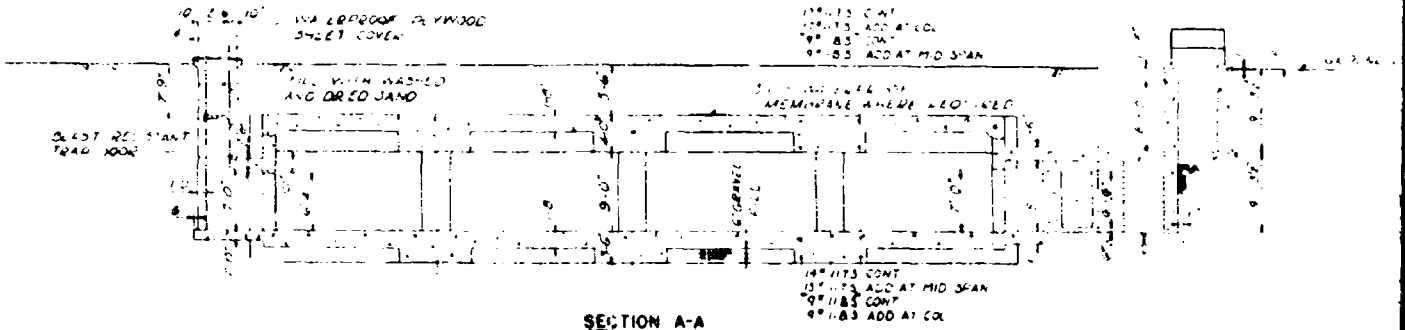
SCALE AS NOTED
DRAWING NUMBER 50-18-04
SHEET 2 OF 2

DATE MAY 1956



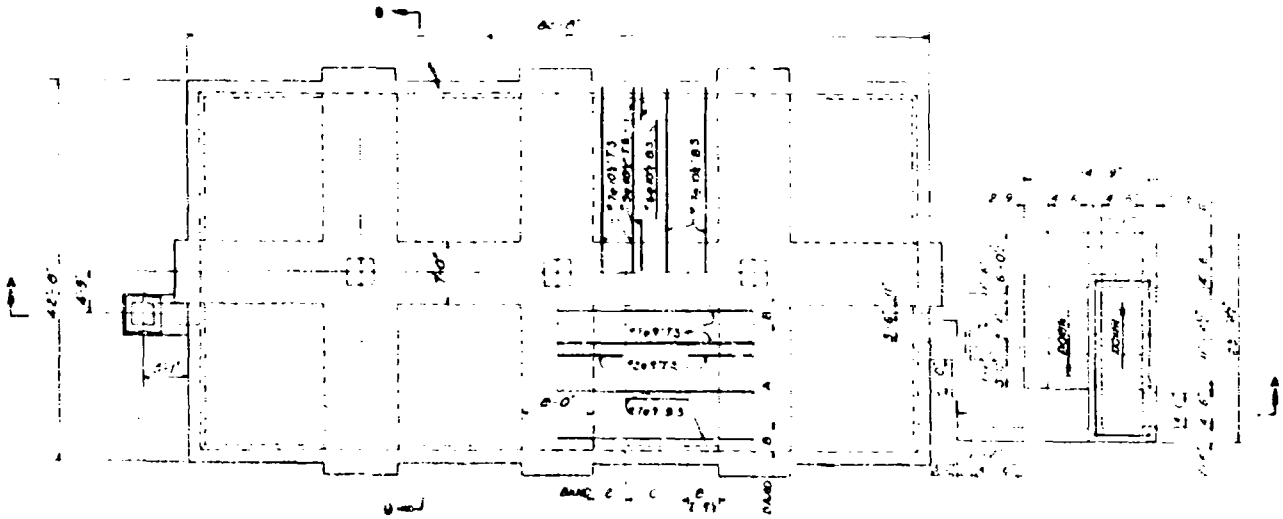
FLOOR PLAN

SCALE: 1/8" = 1'-0"



SECTION A-A

SCALE: 1/8" = 1'-0"



ROOF PLAN

SCALE: 1/8" = 1'-0"

DESIGN CONDITIONS

Design Procedure
In accordance with OCE manual, Design of Structures for Protection from the Effects of Atomic Weapons

Design Blast Wave
Peak incident pressure = 100 psi Duration 0.64 sec

Blast Loading On Exterior Surface
Peak pressure = 100psi Duration 0.64 sec

Nuclear Radiation Protection
Total gamma and neutron attenuation to 5% for a distant medium of any material which will produce a peak blast pressure equal to 100psi

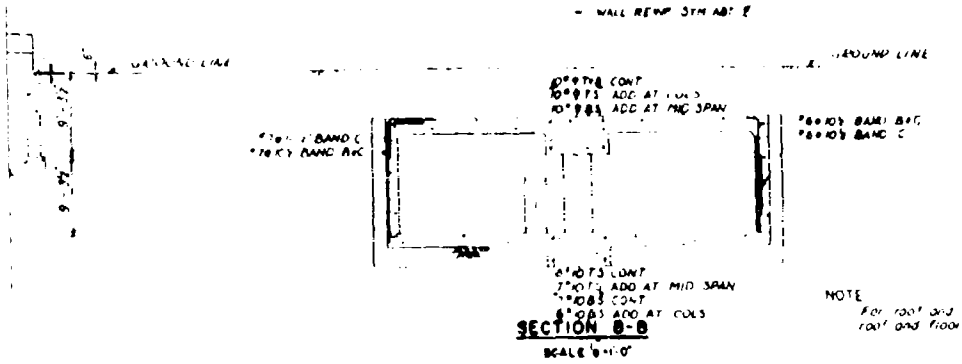
Strength of Materials

	Static	Blast Design
Soil bearing capacity	8000psf*	16,000psf
Concrete, f'c	3000psi	6,500psi
Reinf steel, lower yield (Int Grade, ASTM A305 30T)	47,500psi	52,000psi
Structural steel, lower yield (ASTM A7 30)	38,000psi	41,600psi

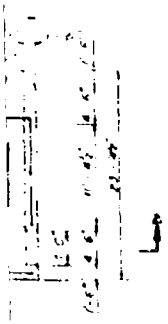
*Ultimate capacity of soil

Allowable Stresses and Deflections
Roof, walls, floor, foundation may be designed to yield, deformation under design blast load. Roof, door, and escape hatch must be designed to not exceed deformation under design blast load

General Notes
1. The following features are not shown and shall be determined to suit use requirements
   - Interior partitions
   - Mechanical and electrical equipment
   - Air locks and decontamination facilities
2. Access stairs may be varied as required
3. Access ramp may be provided if required for vehicles
4. Blast protection to be applied to all exterior doors



NOTE
For roof and floor reinf see roof and floor plans



DIVISION	DATE	DESCRIPTION	BY	CHECKED

AMMANN & WHITNEY
CONSULTING ENGINEERS
111 - 5TH AVE., NEW YORK, N.Y.

DEPARTMENT OF THE ARMY
OFFICE OF THE CHIEF OF ENGINEERS
MILITARY CONSTRUCTION ENGINEERING DIVISION
WASHINGTON, D.C.

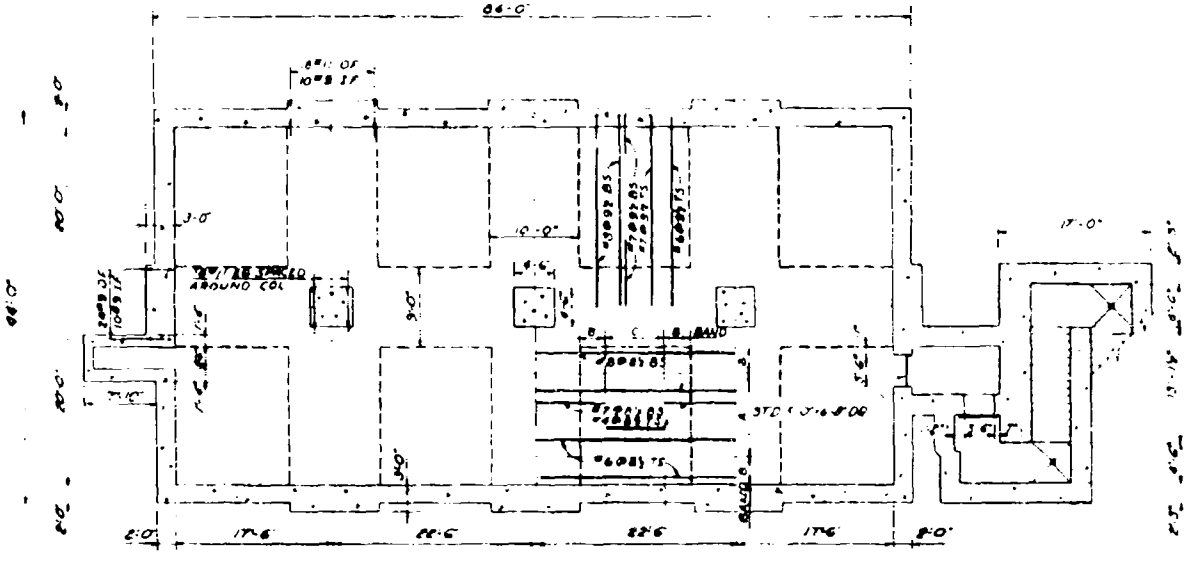
DESIGNED BY B.B.
DRAWN BY
CHECKED BY
APPROVED BY

PROTECTIVE CONSTRUCTION
GENERAL PURPOSE STRUCTURE
BURIED RECTANGULAR
100 PSI BLAST RESISTANT

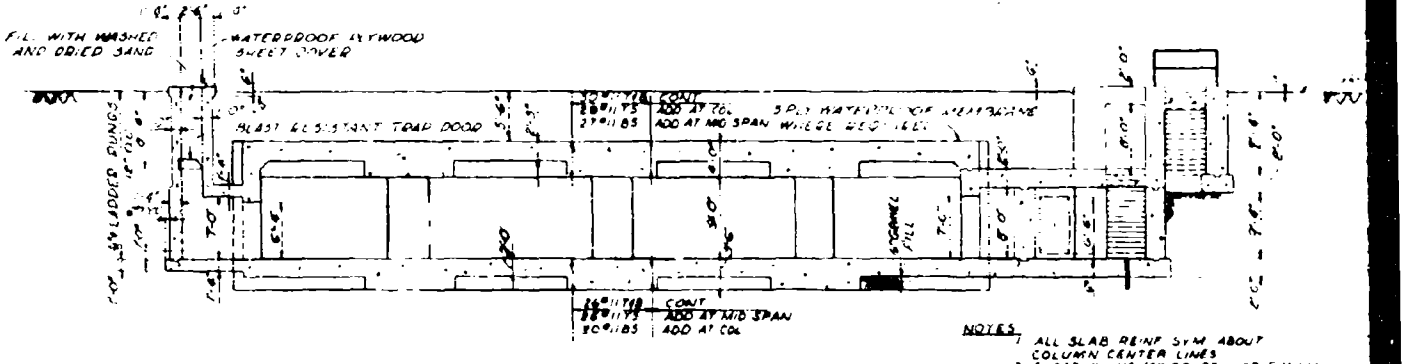
AS NOTED
DRAWING NUMBER 60-10-04
SHEET 1 OF 1

DATE

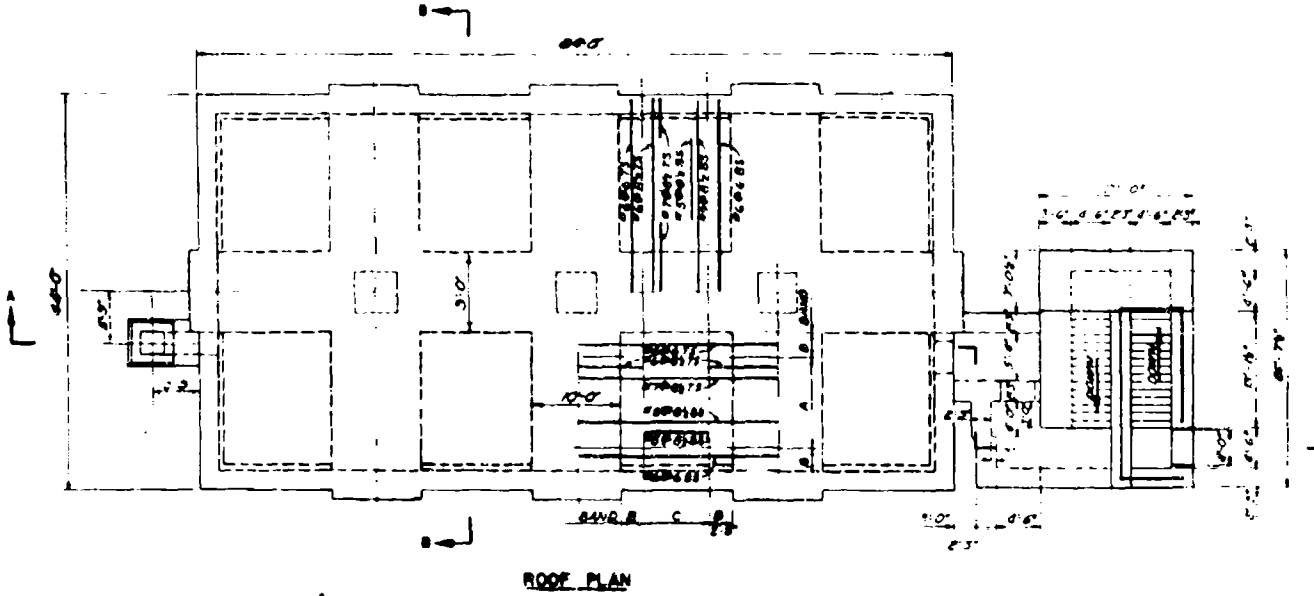
2



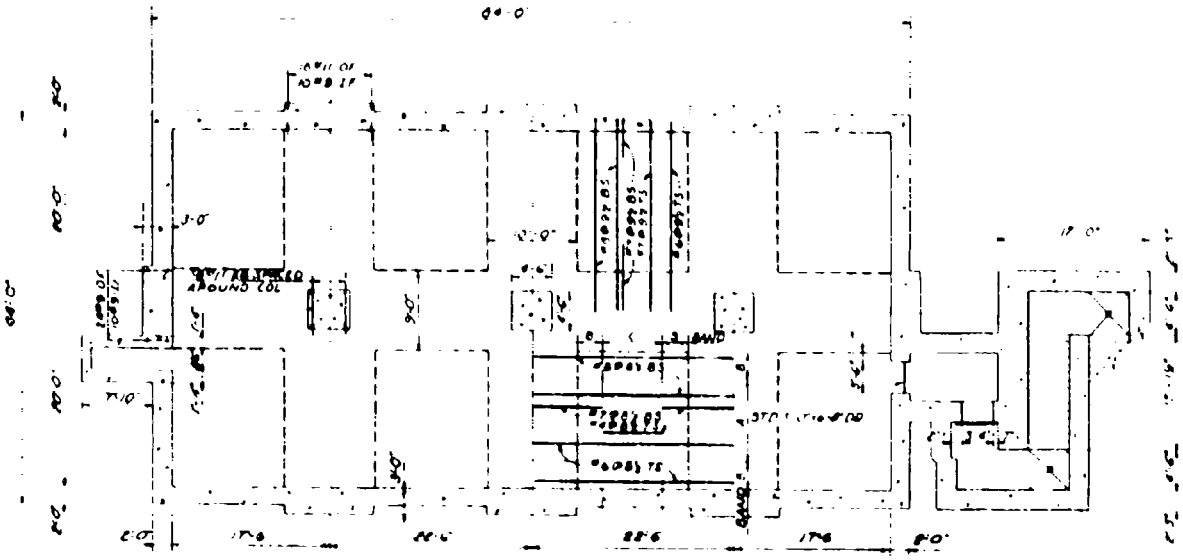
FLOOR PLAN



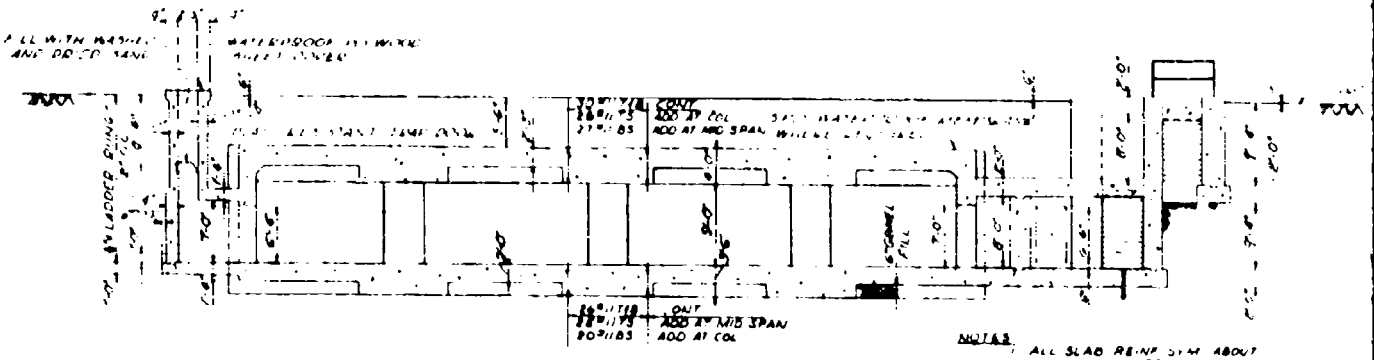
SECTION A-A



ROOF PLAN

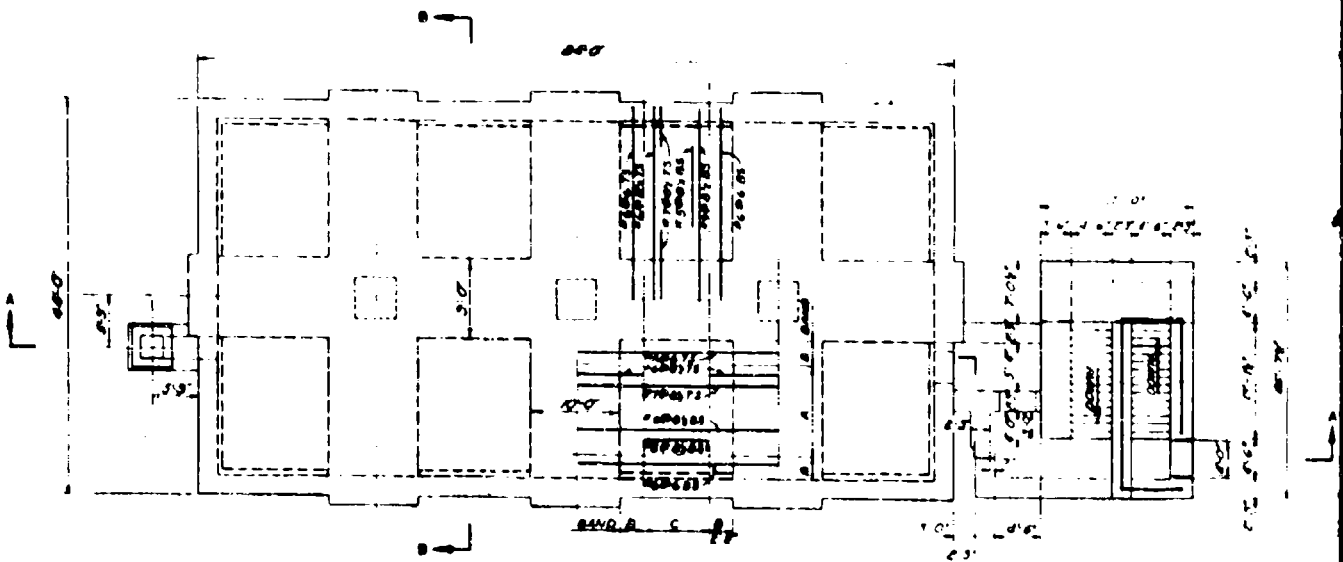


FLOOR PLAN



SECTION A-A

NOTES:
1. ALL SLAB REINF SYM ABOUT COLUMN CENTER LINES
2. SHEAR REINF (STIRRUPS) NOT SHOWN



ROOF PLAN

DESIGN CONDITIONS

Design Procedure

In accordance with OCE manual, "Design of Structures for Protection from the Effects of Atomic Weapons."

Design Blast Wave

Peak incident pressure = 200psi Duration = 0.43 sec

Blast Loading on Exterior Surface

Peak pressure = 200psi Duration = 0.43 sec

Nuclear Radiation Protection

Total gamma and neutrons attenuated to 50r for a 500KT weapon at any position which will produce a peak blast pressure equal to 200psi

Strength of Materials

	Static	Blast Design
Soil bearing capacity	8,000psf*	16,000psf
Concrete,*	5,000psi	6,500psi
Hard steel, low yield (hot rolled ASTM A305 Sp37)	42,000psi	52,000psi
Structural steel, lower yield (ASTM A7-50)	38,000psi	41,600psi

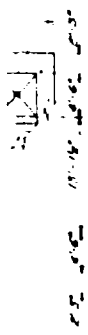
*Allowable capacity of soil

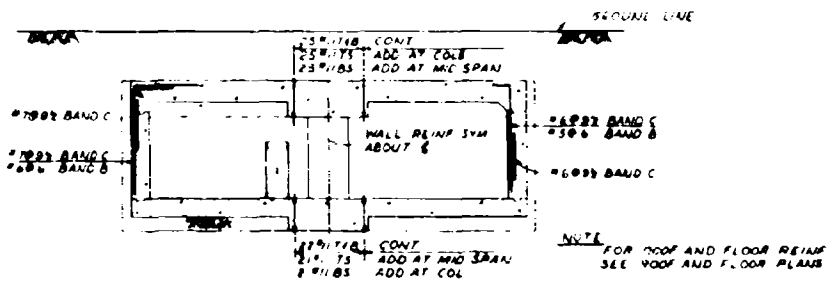
Allowable Stresses and Deflections

Roof, walls, floor and entrance only designed for plastic deformation under design blast load. Blast doors and escape hatch door designed for maximum elastic deformation under design blast load.

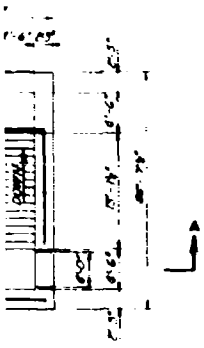
General Notes

1. The following features are not shown and shall be determined to suit use requirements:
   - Interior partitions
   - Mechanical and electrical equipment
   - Air locks and decontamination facilities
2. Access stairs may be added as required.
3. Access ramp may be provided if required for vehicles.
4. Thermal protection to be applied to all exterior doors.





SECTION B-B



REVISION	DATE	DESCRIPTION	BY	APPR

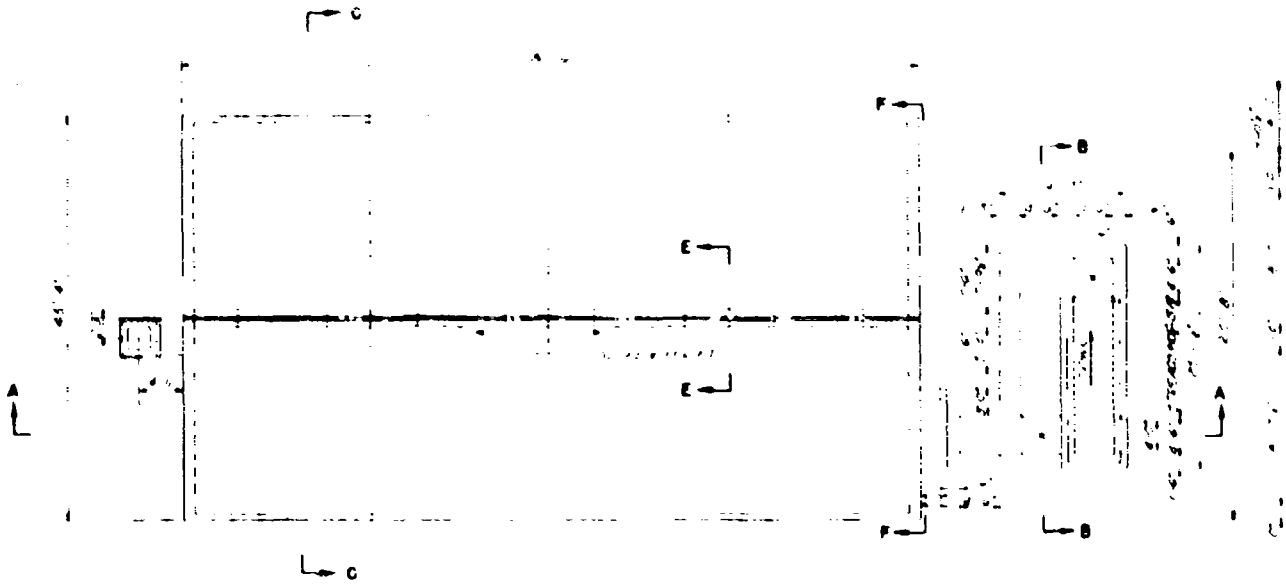
AMMANN & WHITNEY
CONSULTING ENGINEERS
111-5TH AVENUE, NEW YORK, N. Y.

DEPARTMENT OF THE ARMY
OFFICE OF THE CHIEF OF ENGINEERS
MILITARY CONSTRUCTION ENGINEERING DIVISION
WASHINGTON, D. C.

DESIGNED BY B.B.
DRAWN BY
CHECKED BY N.P.
APPROVED
DATE

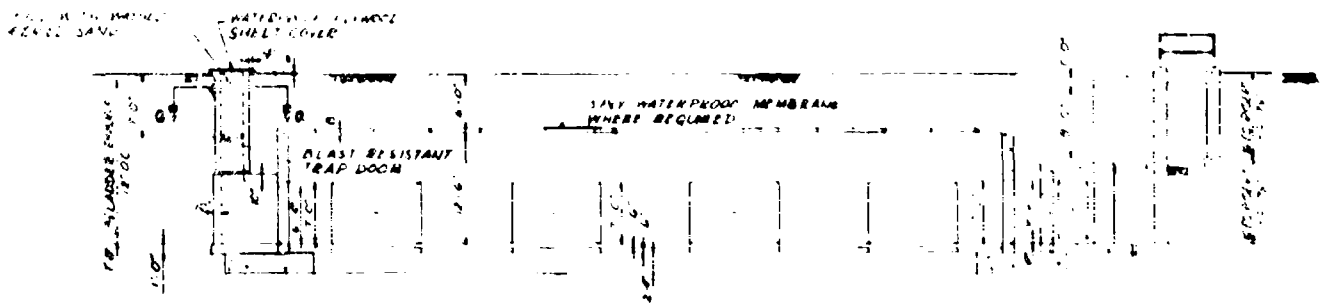
PROTECTIVE CONSTRUCTION
GENERAL PURPOSE STRUCTURE
BURIED RECTANGULAR
200 PSI BLAST RESISTANT

SCALE 1/4"=1'-0" SIZE 24"
DRAWING NUMBER 60-18-04
SHEET 1 OF 1



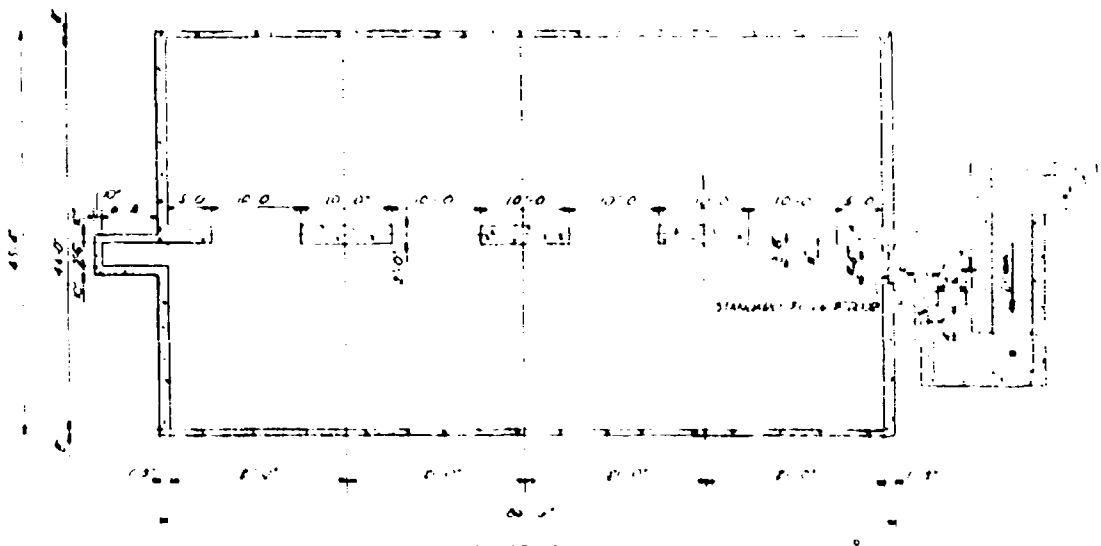
ROOF PLAN

SCALE $\frac{1}{8}$"=1'-0"



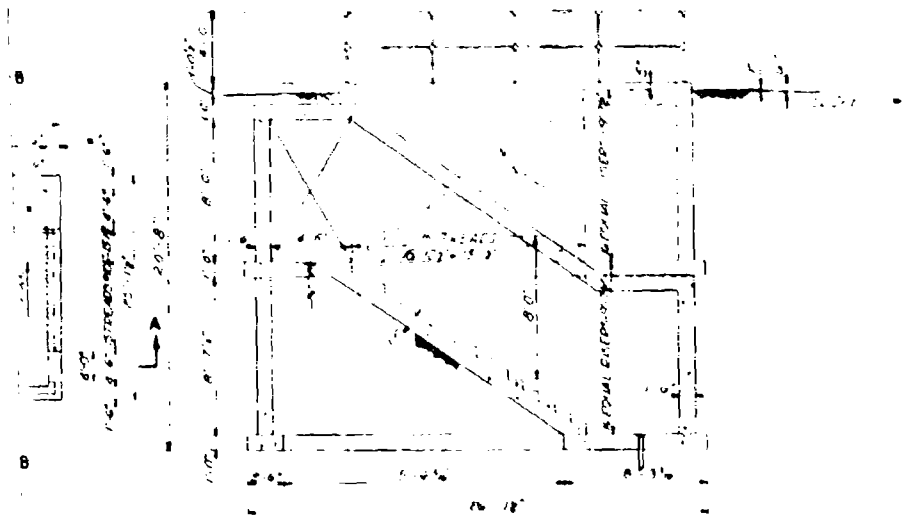
SECTION A-A

SCALE $\frac{1}{8}$"=1'-0"



FLOOR PLAN

SCALE $\frac{1}{8}$"=1'-0"



SECTION B-B

SCALE NTS

DESIGN CONDITIONS

Design Procedure

In accordance with OCE manual, "Design of Structures for Protection from the Effects of Atomic Weapons"

Design Blast Wave

Peak incident pressure [illegible] psi

Blast Loading On Exterior Surface

Peak pressure [illegible] psi

Nuclear Radiation Protection

[illegible] at any location of the structure peak blast pressure equal to 50 psi

Strength of Materials

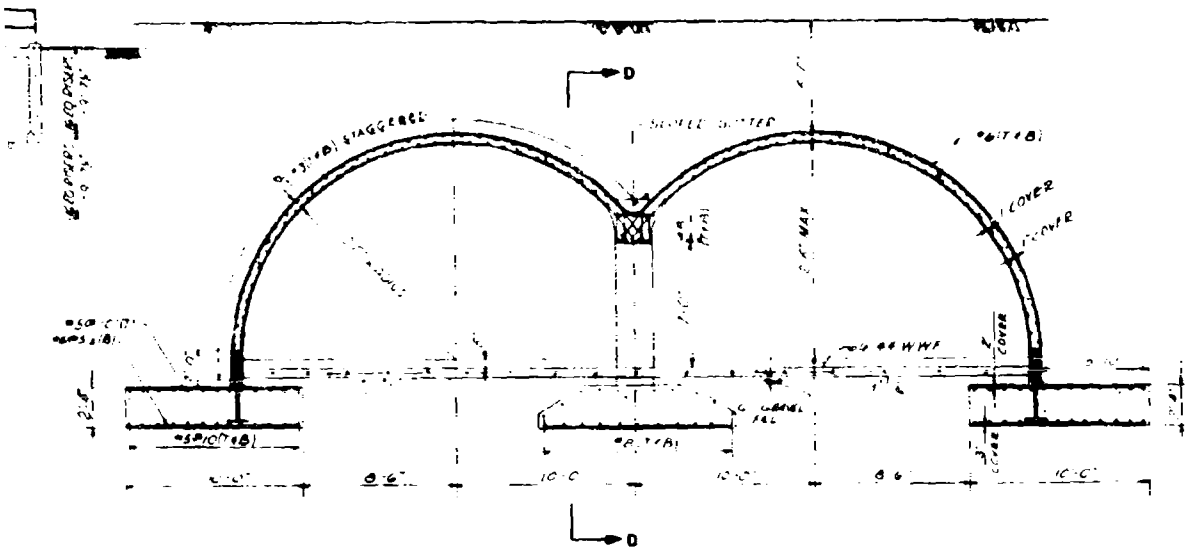
	Static	Blast Design
[illegible]	[illegible]	[illegible]
Concrete		
Arches	[illegible]	[illegible]
Remainder of structure	[illegible]	[illegible]
Reinforcing steel [illegible]	[illegible]	[illegible]
Structural steel [illegible]	[illegible]	[illegible]
Structural steel [illegible]	[illegible]	[illegible]
ASTM A7 Steel		
Bond capacity of steel		

Allowable Stresses and Deflections

The [illegible] entrance ways designed for maximum deformation under design blast load. Arch, blast door and escape hatch door designed for maximum elastic deformation under design load.

General Notes

1. The following features are not shown and shall be determined to suit site requirements:
   - [illegible]
   - Mechanical and electrical equipment
   - Architectural decorations, fixtures
2. Access stairs may be varied as required.
3. Access ramp may be provided if required for vehicles.
4. For entrance way reinforcement and blast door details see Buried Reinforced Ships Structure Dwg. No. 60-18-04.

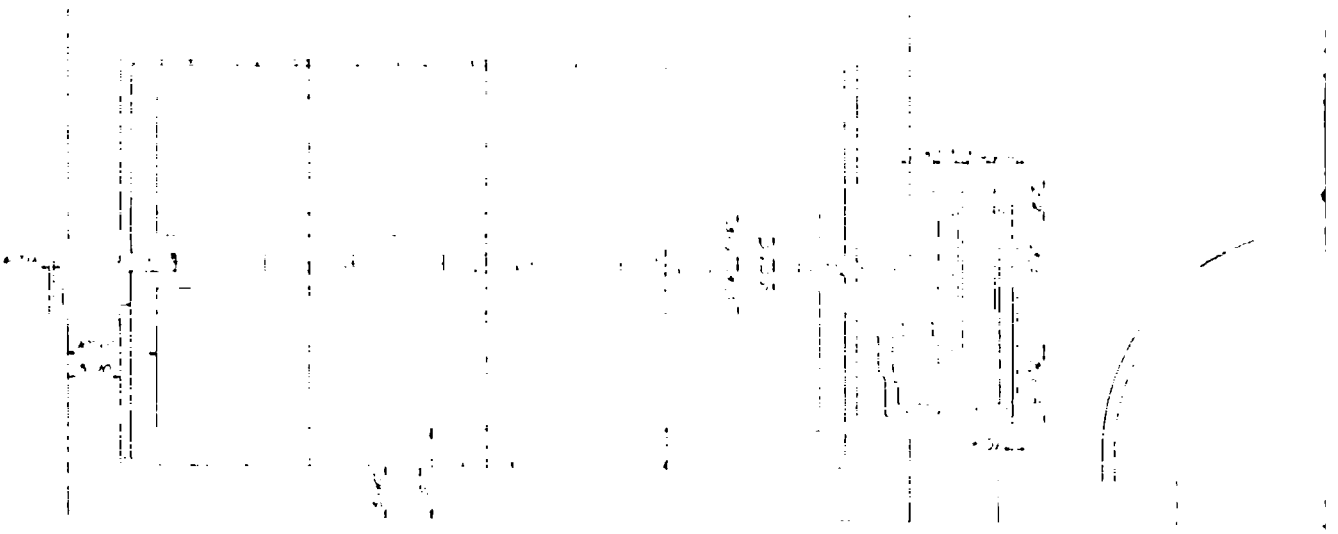


SECTION C-C

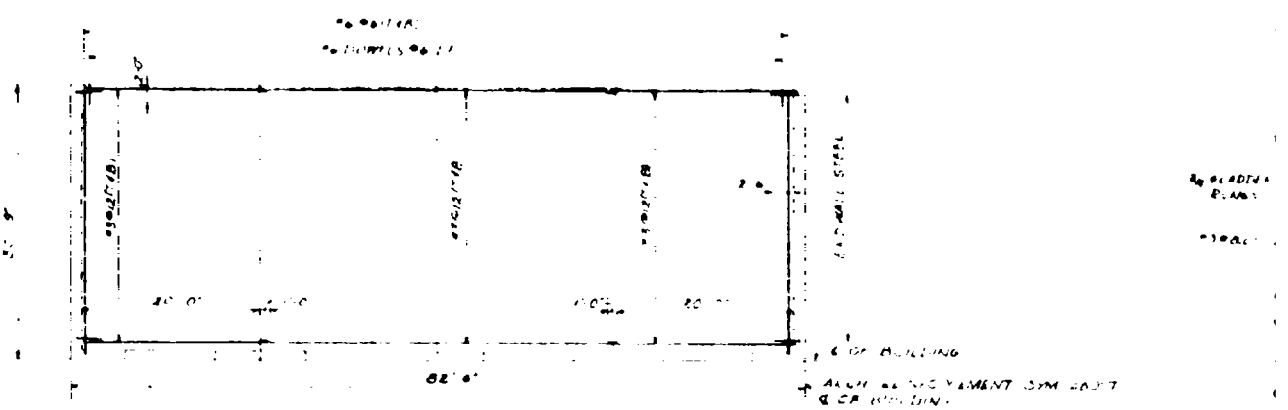
SCALE: 1/4" = 1'-0"

AMMANN & WHITNEY 111 - 6th AVENUE, NEW YORK, N. Y.	DEPARTMENT OF THE ARMY OFFICE OF THE CHIEF OF ENGINEERS CORPS OF ENGINEERS
DESIGNED BY J.S. DRAWN BY CHECKED BY J.F. APPROVED	PROTECTIVE CONSTRUCTION GENERAL PURPOSE STRUCTURE BURIED DOUBLE BARREL ARCH 50 PSI BLAST RESISTANT
	SCALE AS NOTED DRAWING NUMBER 60-18-05 SHEET 1 OF 2

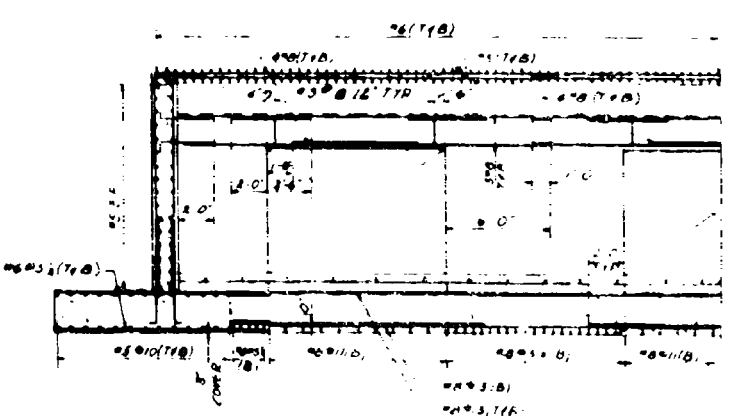
2



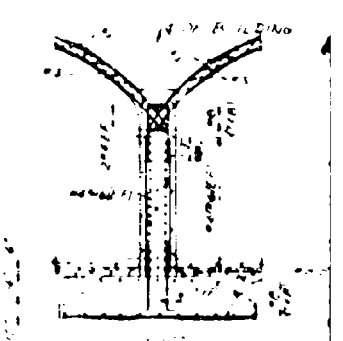
FOUNDATION PLAN
SCALE $\frac{1}{8}$"=1'-0"



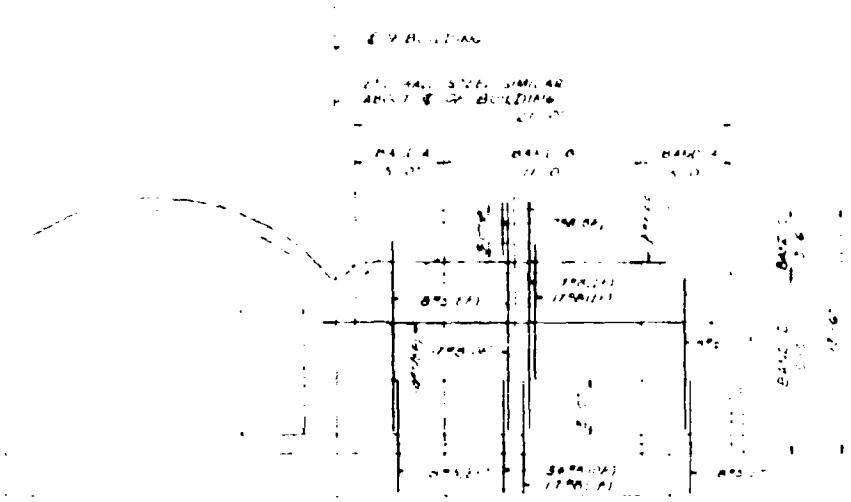
DEVELOPED ROOF PLAN
SCALE $\frac{1}{8}$"=1'-0"



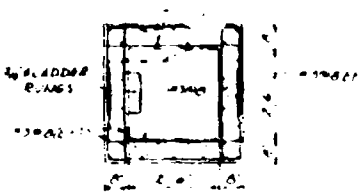
SECTION D-D
SCALE $\frac{1}{8}$"=1'-0"



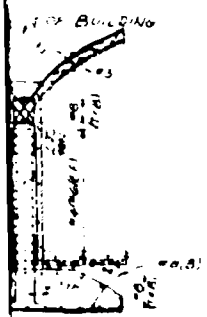
SECTION E-E
SCALE $\frac{1}{8}$"=1'-0"



SECTION F-F
SCALE 1/4"=1'-0"



SECTION G-G
SCALE 1/4"=1'-0"



N E-E
1/4"=1'-0"

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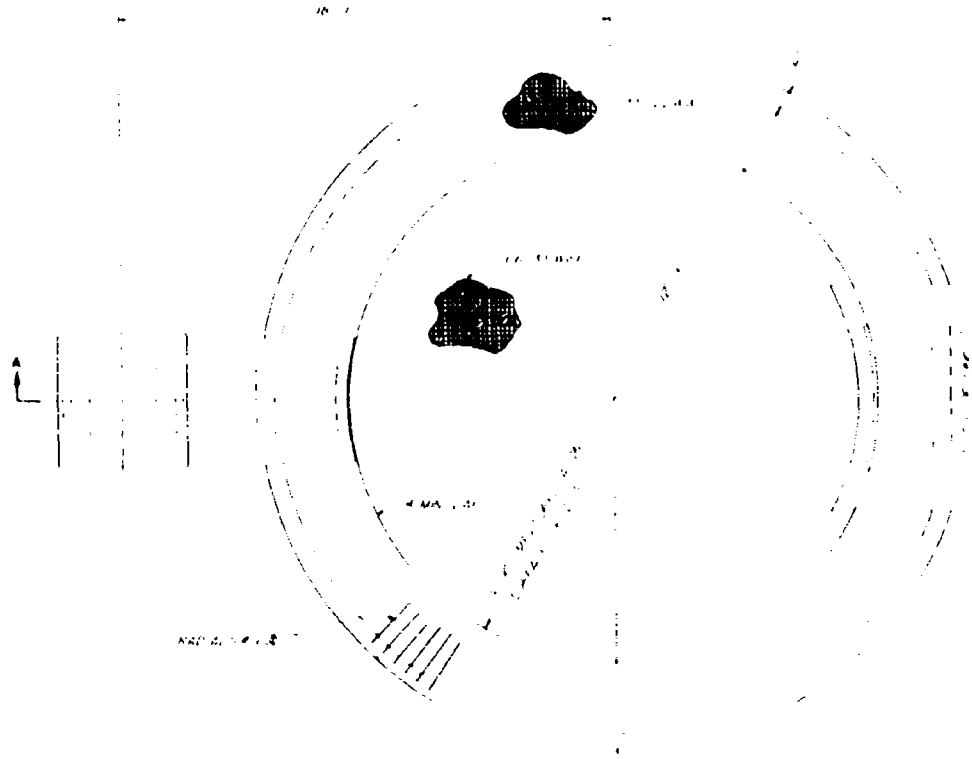
DEPARTMENT OF THE ARMY
OFFICE OF THE CHIEF OF ENGINEERS
MILITARY CONSTRUCTION ENGINEERING DIVISION
WASHINGTON, D.C.

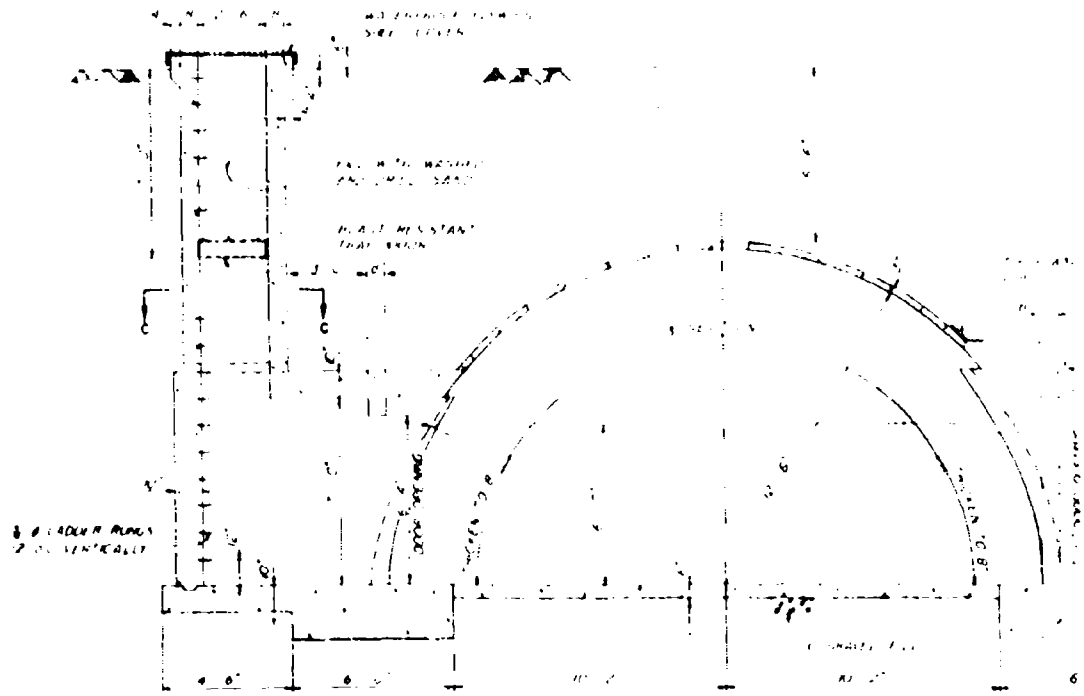
PROTECTIVE CONSTRUCTION
GENERAL PURPOSE STRUCTURE
BURIED DOUBLE BARREL ARCH
50 PSI BLAST RESISTANT

SCALE AS NOTED
DRAWING NUMBER
60-18-05
SHEET 2 OF 2

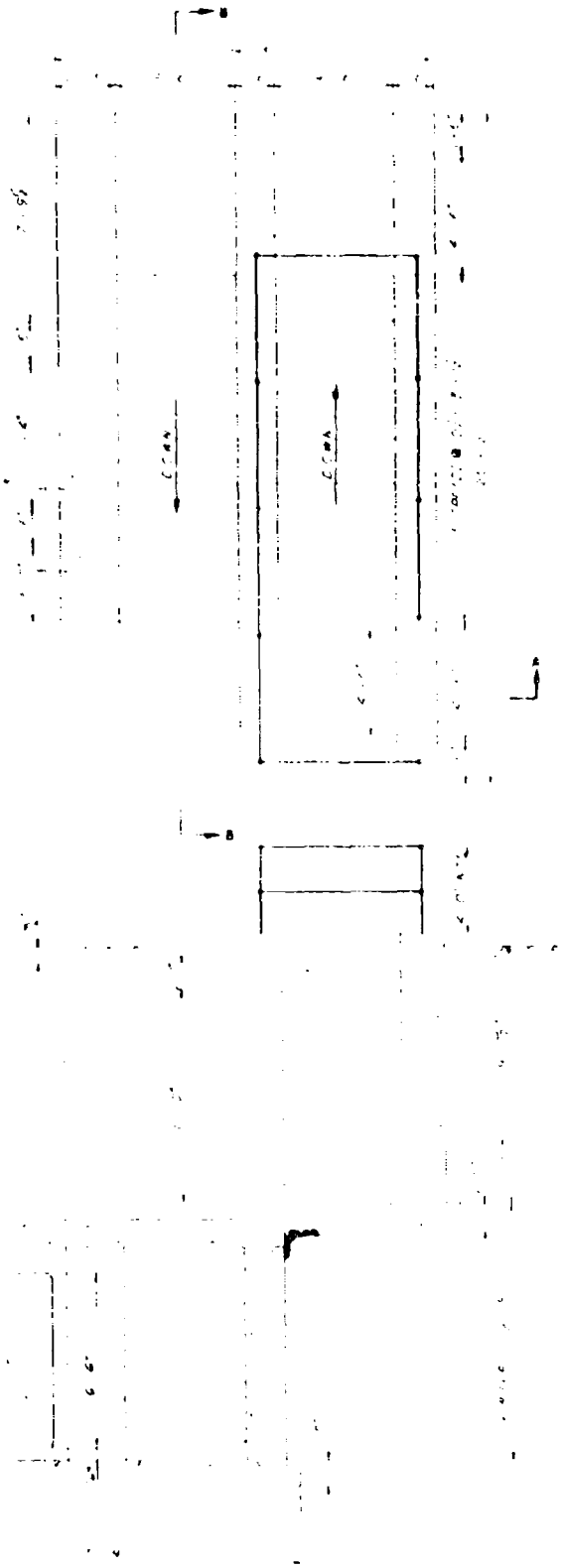
2



ROOF PLAN



SECTION A-A



DESIGN CONDITIONS

Design Procedure

In accordance with U.S. manual, "Design of Structures to Resist the Effects of Atomic Weapons"

Design Blast Wave

Peak overpressure [illegible] Scaled [illegible]

Blast Loading on Exterior Surface

Peak [illegible] Scaled [illegible]

Nuclear Radiation Protection

[illegible]

Strength of Materials

	Static	Blast Loading
Structural steel [illegible]	[illegible]	[illegible]
Concrete, f'c		
Dome	[illegible]	[illegible]
Remainder of structure	[illegible]	[illegible]
Reinforcing steel [illegible]	[illegible]	[illegible]
[illegible]		
Structural steel [illegible] (ASTM [illegible])	[illegible]	[illegible]
[illegible]		

Allowable Stresses and Deflections

[illegible]

General Notes

[illegible]

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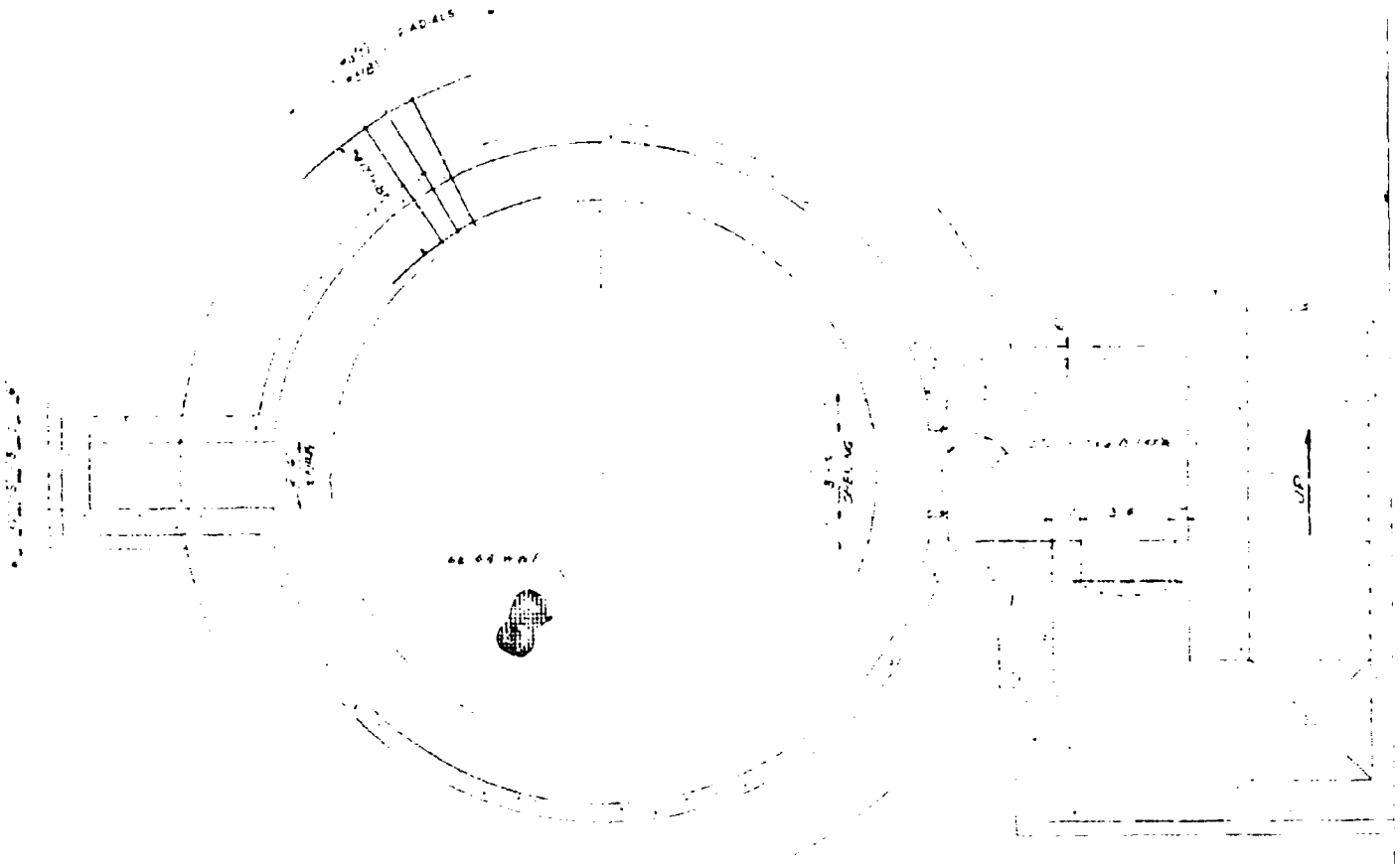
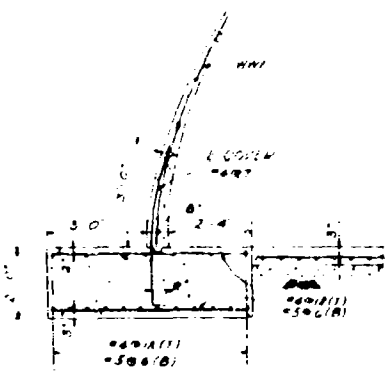
DESIGN BY		PROTECTIVE CONSTRUCTION GENERAL PURPOSE STRUCTURE BURIED DOME 60 PSI BLAST RESISTANT	
DRAWN BY			
CHECKED BY			
APPROVED BY			
DATE			60-18-06
		SHEET 1	OF 2

2



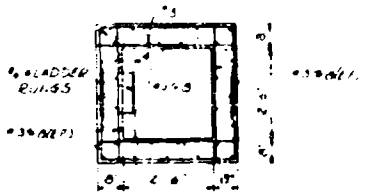
FLOOR SLAB AND FOUNDATION PLAN

SCALE 1/8" = 1'-0"



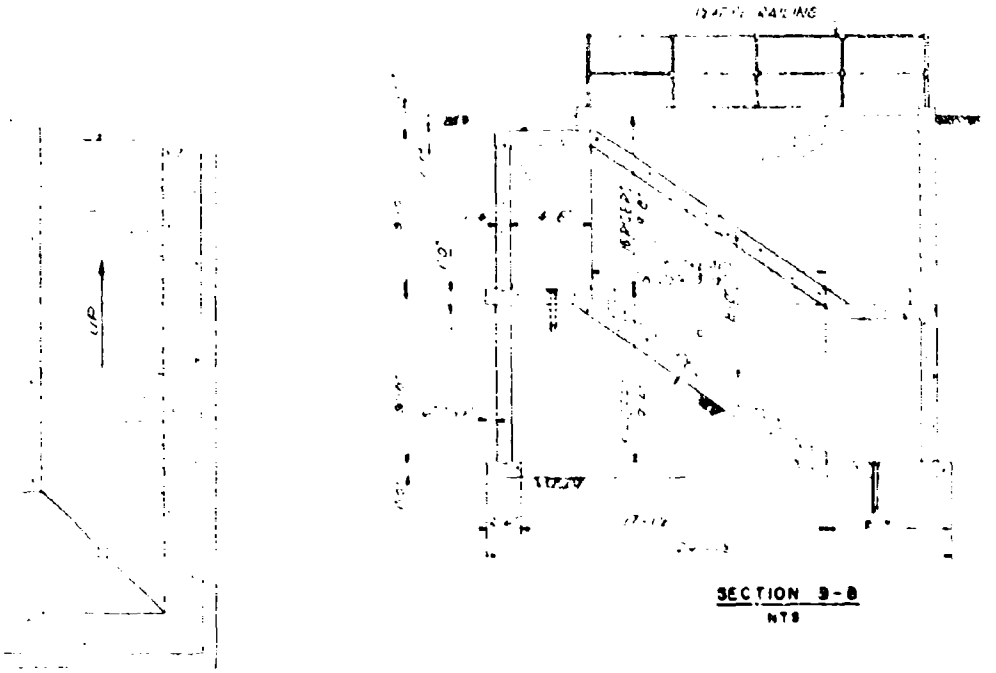
DETAIL OF FOOTING

SCALE 1/8" = 1'-0"



SECTION C-C

SCALE 1/8" = 1'-0"



SECTION B-B
NTS

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CONSULTING ENGINEERS
111 5TH AVENUE, NEW YORK, N.Y.

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
DIVISION CONSTRUCTION ENGINEERING
WASHINGTON, D.C.

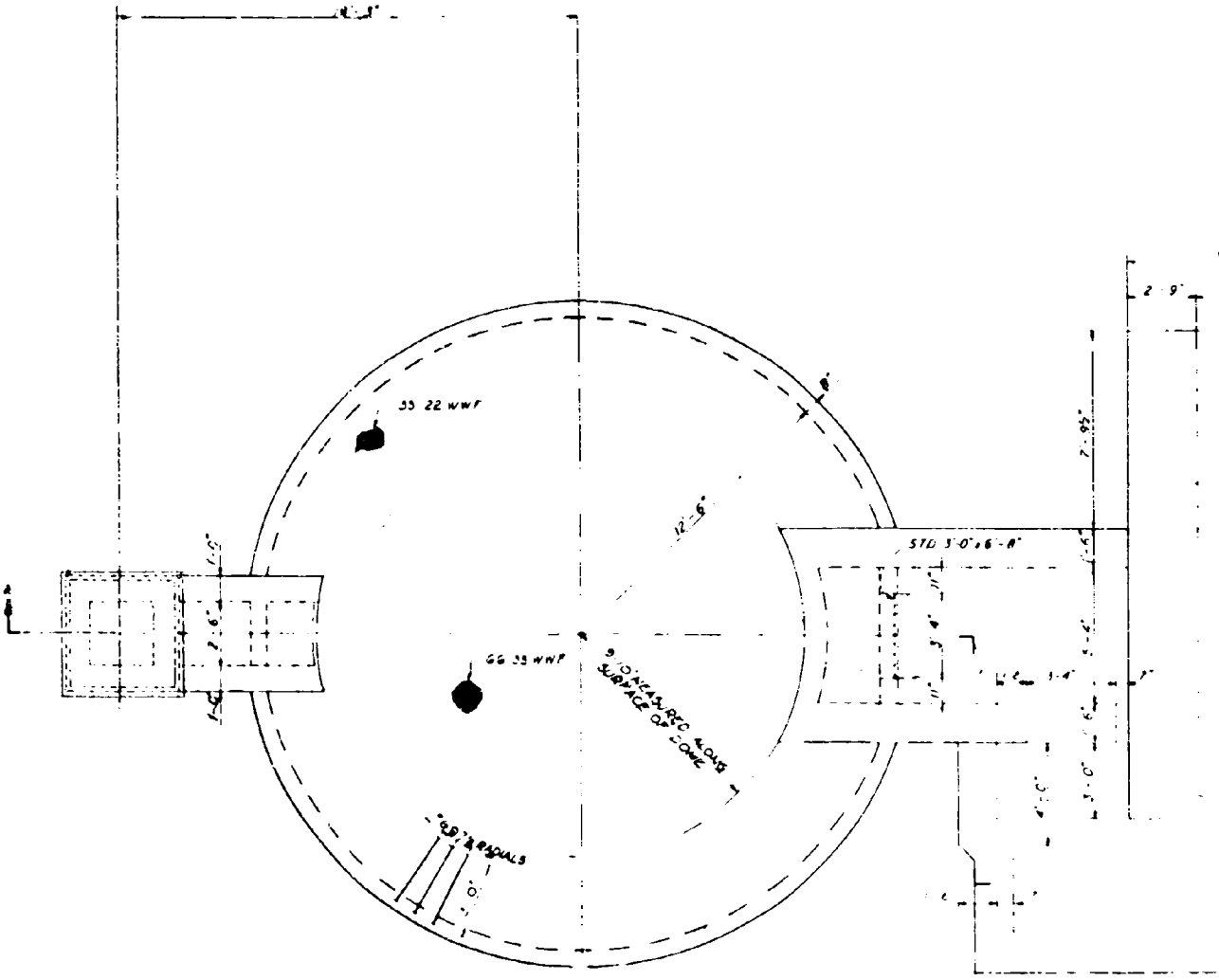
PROTECTIVE CONSTRUCTION
GENERAL PURPOSE STRUCTURE
BURIED DOME
30 PSI BLAST RESISTANT

AS NOTED

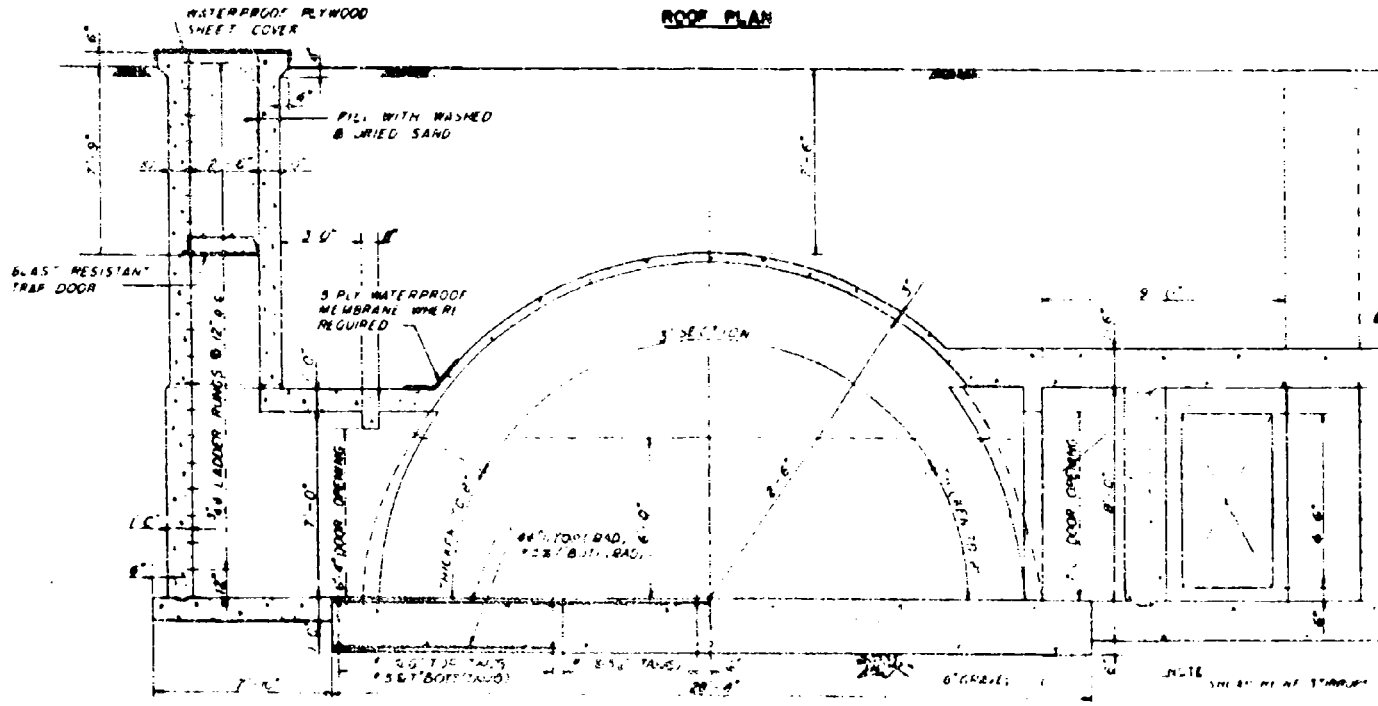
DRAWING NUMBER
60-16-06

SHEET 2 OF 2

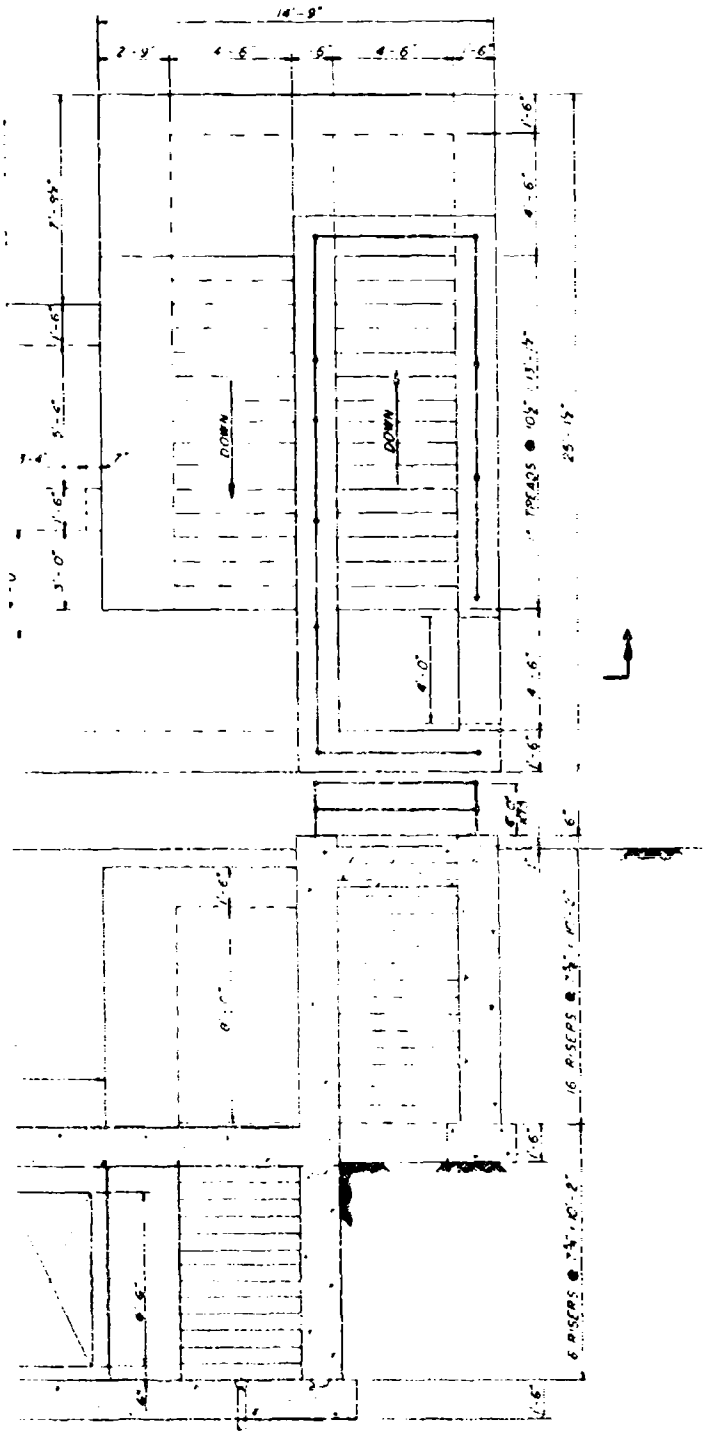
2



ROOF PLAN



SECTION A-A



DESIGN CONDITIONS

Design Procedure
In accordance with OCE manual, "Design of Structures for protection from the Effects of Atomic Weapons."

Design Blast Wave
Peak incident pressure = 100psi; Duration = 0.64 sec.

Blast Loading on Exterior Surface
Peak pressure 100psi; Duration 0.64 sec.

Nuclear Radiation Protection
Total gamma and neutrons attenuated to 50r for a 200KT weapon at one position which will produce a peak blast pressure equal to 100psi.

Strength of Materials

	Static	Blast Design
Soil bearing capacity	8000 psf*	16,000 psf
Concrete, f_c		
Dome	3000 psi	3900 psi
Remainder of Structure	5000psi	6500 psi
Round steel, lower yield (Int. Grade, ASTM A305-50T)	45,000psi	58,000psi
Structural steel, lower yield (ASTM A7-50)	36,000psi	46,600psi

* rated capacity of soil

Allowable Stresses and Deflections
The foundation and entrance walls are designed for plastic deformation under design blast loads. Other elements of the escape hatch cover are designed for limited plastic deformation under design blast load.

General Notes
1. The following features are not shown and shall be determined to suit site requirements.
   - Interior partitions
   - Mechanical and electrical equipment
   - Air locks and decontamination facilities
2. Access stairs may be varied as required.
3. Access ramp may be provided if required for vehicles.
4. Thermal protection to be applied to all exterior doors.

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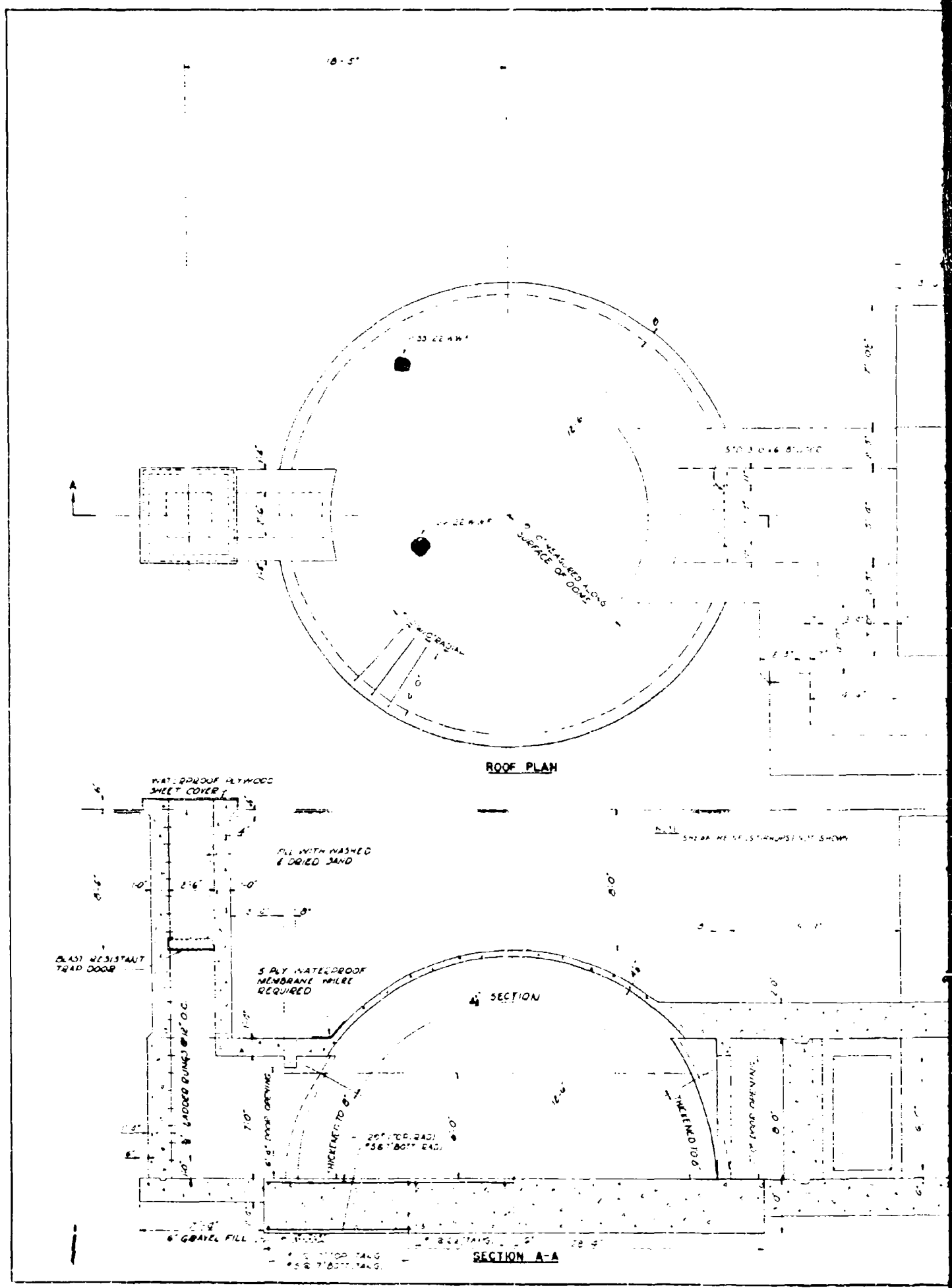
DRAWN BY J.S.	PROTECTIVE CONSTRUCTION GENERAL PURPOSE STRUCTURE BURIED DOME 100 PSI BLAST RESISTANT			
PLANNED BY				
CHECKED BY				
APPROVED				

2


ROOF PLAN
SECTION A-A
WATERPROOF PLYWOOD SHEET COVER
FILL WITH WASHED & DRIED SAND
BLAST RESISTANT TRAP DOOR
5 PLY WATERPROOF MEMBRANE WHERE REQUIRED
4" SECTION
6" GRAVEL FILL

DESIGN CONDITIONS

Design Procedure
In accordance with OCE manual, "Design of Structures for protection from the Effects of Atomic Weapons."

Design Blast Wave
Peak incident pressure = 200 psi Duration = [illegible] sec.

Blast Loading on Exterior Surface
Peak pressure = 200 psi Duration = 0.41 sec.

Nuclear Radiation Protection
[illegible] gamma and neutrons attenuated to 50 [illegible] [illegible] of [illegible] which will produce 0 [illegible] [illegible] 200 psi

Strength of Materials

	Static	Blast Design
Soil bearing capacity	[illegible] psf	[illegible] psf
Concrete, f'c		
Dome	3000 psi	3900 psi
Remainder of structure	3000 psi	6500 psi
Reinf. steel, lower yield (Int. Grade, ASTM A 305 50T)	47,500 psi	52,000 psi
Structural steel, lower yield (ASTM A7-50)	38,000 psi	41,600 psi

* rated capacity of soil

Allowable Stresses and Deflections
The foundation and walls are fully designed for plastic deformation under design blast load. Roof and floor are designed for maximum elastic deformation under design blast load.

General Notes
1. The following features are not shown and shall be determined to suit use requirements
   - Interior partitions
   - Mechanical and electrical equipment
   - Air locks and decontamination facilities
2. Access stairs may be varied as required
3. Access ramp may be provided if required for vehicles
4. Thermal protection to be applied to all exterior doors

REVISION	DATE	DESCRIPTION	BY	APPROVAL

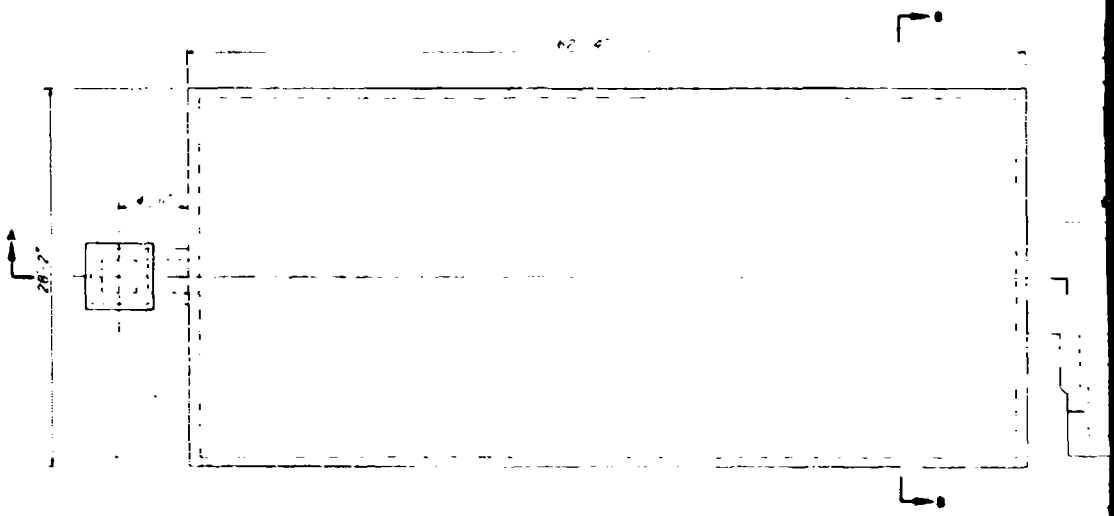
AMMANN & WHITNEY
CONSULTING ENGINEERS
111 8TH AVENUE, NEW YORK, N. Y.

DEPARTMENT OF THE ARMY
OFFICE OF THE CHIEF OF ENGINEERS
MILITARY CONSTRUCTION ENGINEERING DIVISION
WASHINGTON, D. C.

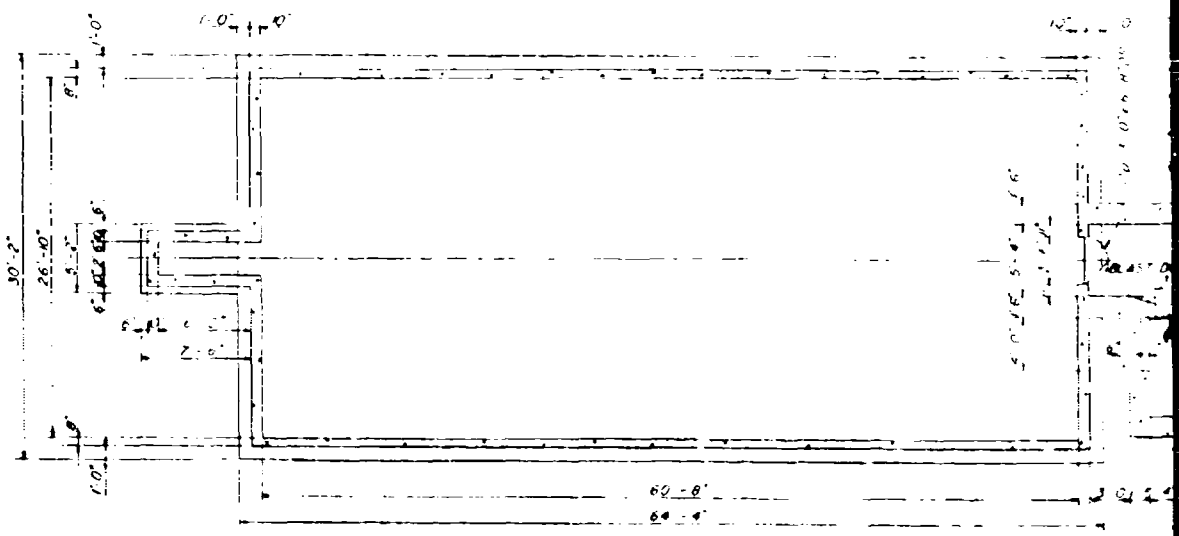
DESIGNED BY J.F.
TRACED BY
CHECKED BY F.
SUBMITTED
APPROVED
APPROVED
CHIEF, MILITARY CONSTRUCTION DIV.
APPROVED
DATE

PROTECTIVE CONSTRUCTION
GENERAL PURPOSE STRUCTURE
BURIED DOME
200 PSI BLAST RESISTANT

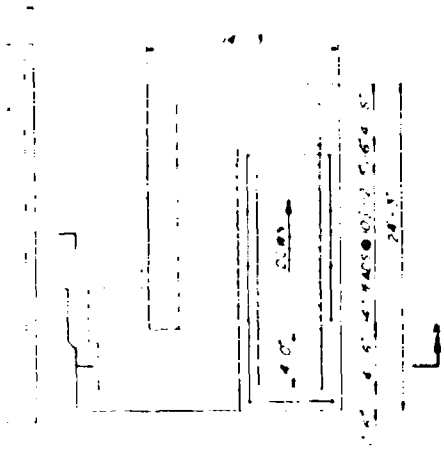
SCALE 1/8" = 1'-0"
DRAWING NUMBER
60-18-06
SHEET 1 OF 1



ROOF PLAN



FLOOR PLAN



DESIGN CONDITIONS

Design Procedure

In conformance with CCE manual "Design of Structures for Protection from the Effects of Atomic Weapons"

Design Blast Wave

Free field peak pressure = 50 psi Duration = 0.85 sec

Blast Loading on Exterior Surface

Peak pressure = 50 psi Duration = 0.85 sec

Nuclear Radiation Protection

Total gamma and neutrons attenuated to 5% for a 100 KT weapon or any yield which will produce a peak blast pressure equal to 50 psi

Strength of Materials	**Static**	**Blast Design**
Soil (bearing capacity)	8,000 psf*	16,000 psf
Concrete, f'c		
Arch	3,000 psi	3,900 psi
Remainder of structure	3,000 psi	6,500 psi
Hard Steel (min. yield)	47,500 psi	52,000 psi
(for Grade ASTM A615 Gr. 60)		
Structural Steel (min. yield)	36,000 psi	41,600 psi
(ASTM A7 Gr. 50)		

*Ultimate capacity of soil

Allowable Stresses and Deflections

The foundation and walls are designed for plastic deformation under design blast load. The roof slab is designed for maximum elastic deformation under design blast load.

General Notes

The following items are not shown and must be determined to suit site requirements:

Exterior partitions
Mechanical and electrical equipment
Air intake and air information equipment

1. All exits must be weather protected.
2. All exits may be protected against vehicles.

REVISION	DATE	DESCRIPTION	BY	APPROVAL

AMMANN & WHITNEY
CONSULTING ENGINEERS
111 8TH AVENUE, NEW YORK, N.Y.

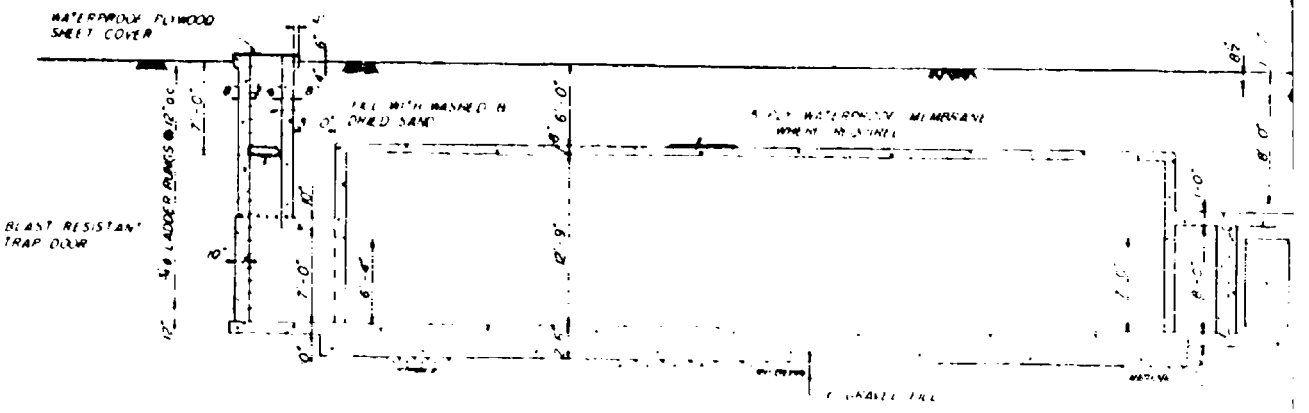
DEPARTMENT OF THE ARMY
OFFICE OF THE CHIEF OF ENGINEERS
MILITARY CONSTRUCTION DESIGN DIVISION
WASHINGTON, D.C.

DESIGNED BY J.S.
DRAWN BY
CHECKED BY G.P.
APPROVED BY
DATE

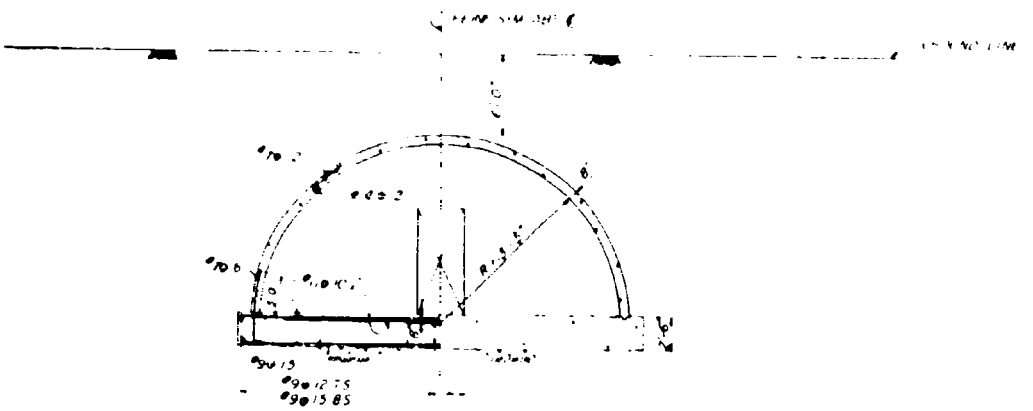
PROTECTIVE CONSTRUCTION
GENERAL PURPOSE STRUCTURE
BURIED CONCRETE IGLOO
50 PSI BLAST RESISTANT

SCALE 1/16" = 1'-0"
DRAWING NUMBER 60-16-07
SHEET 1 OF 2

2



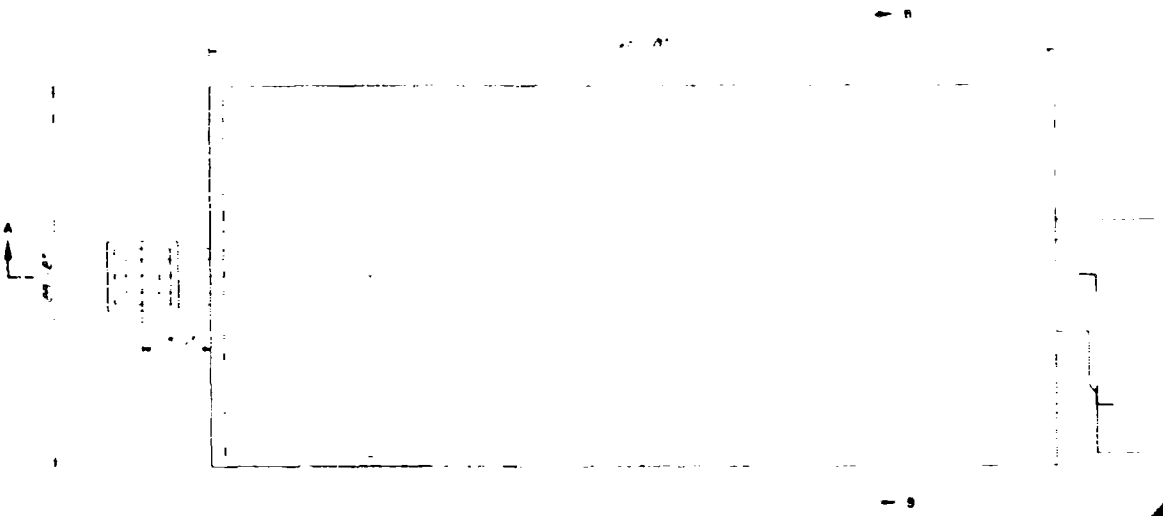
SECTION A-A



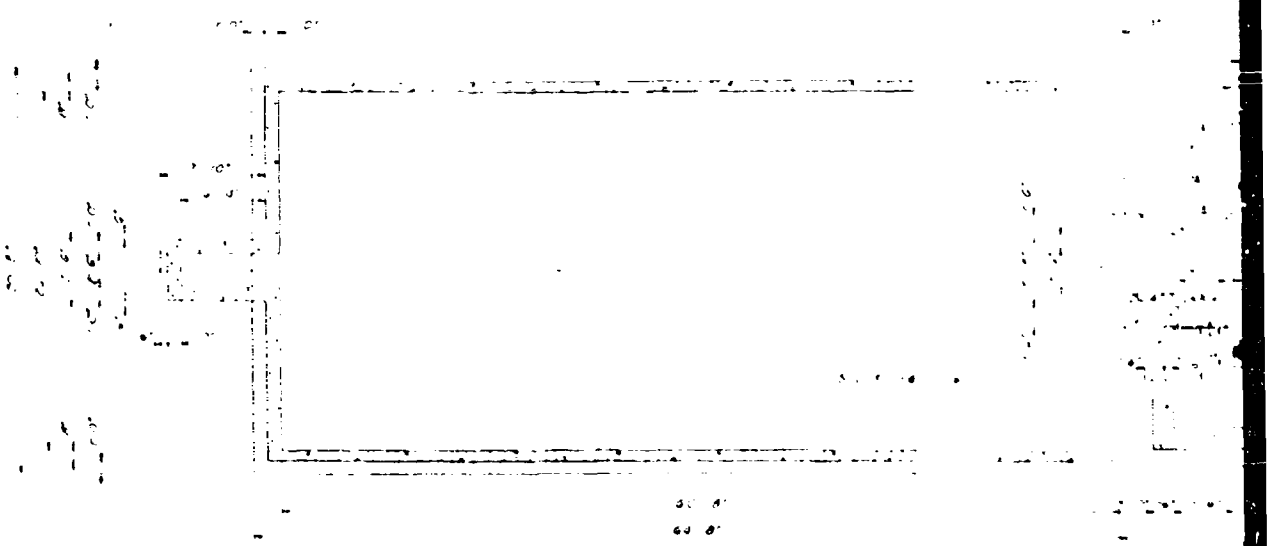
SECTION B-B

AMMANN & WHITNEY CONSULTING ENGINEERS 111 FIFTH AVENUE, NEW YORK, N. Y.	DEPARTMENT OF THE ARMY OFFICE OF THE CHIEF OF ENGINEERS MILITARY CONSTRUCTION ENGINEERING DIVISION WASHINGTON, D. C.
	PROTECTIVE CONSTRUCTION GENERAL PURPOSE STRUCTURE BURIED CONCRETE 18L00 50 PSI BLAST RESISTANT
	1/16" = 1'-0"
	60-18-07
	SHEET 2 OF 2

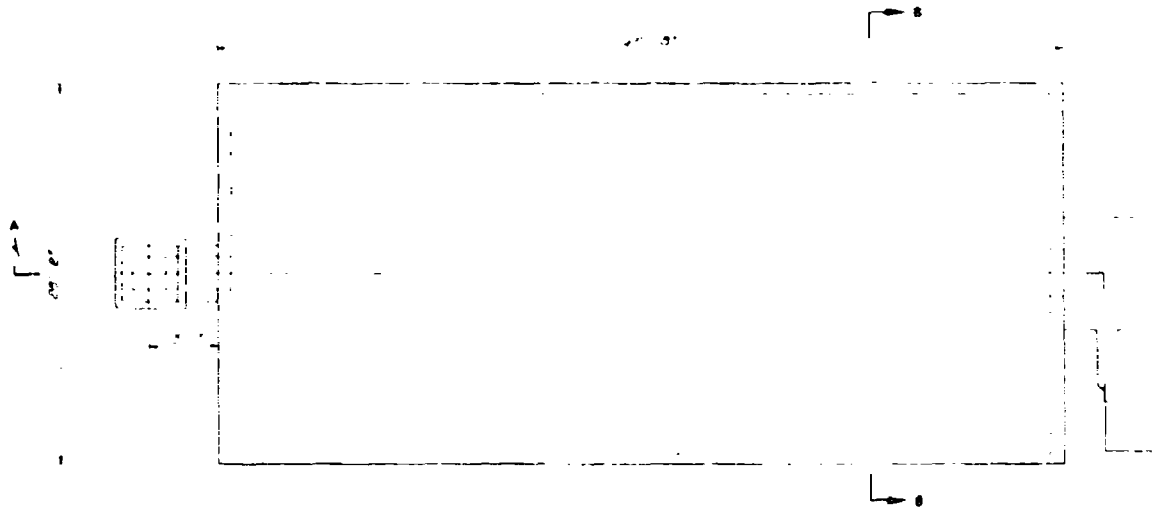
2



ROOF PLAN



FLOOR PLAN



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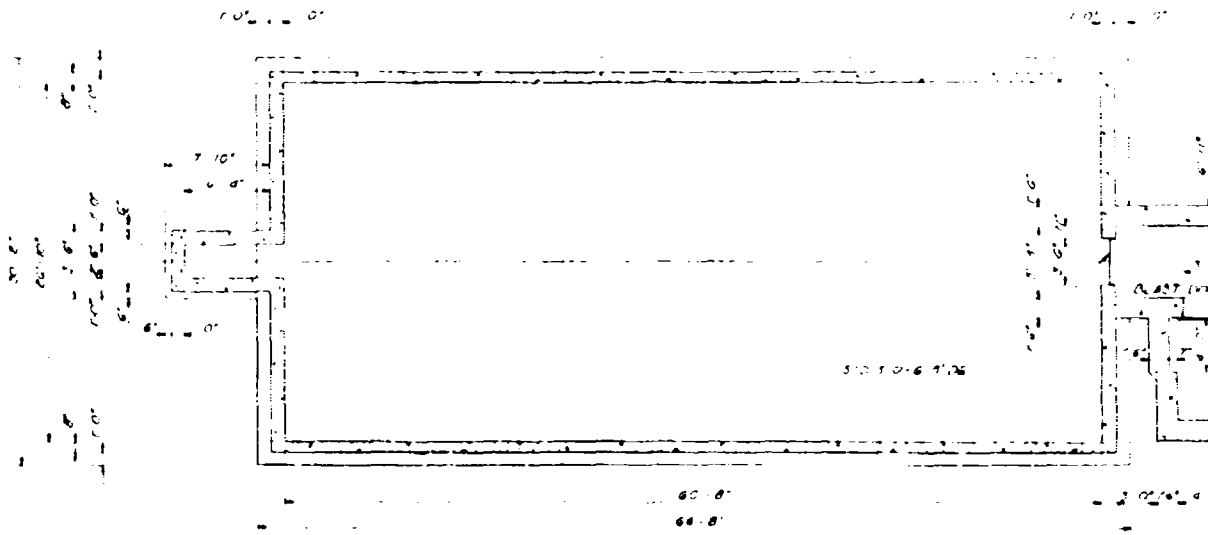

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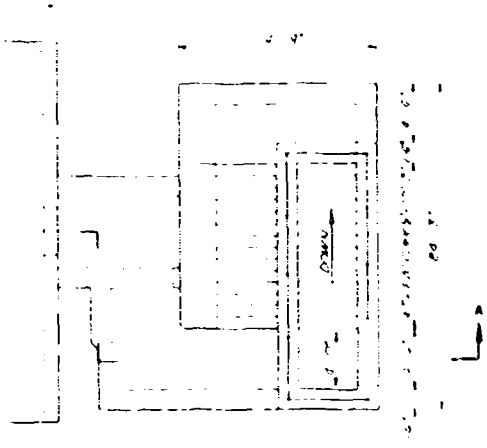
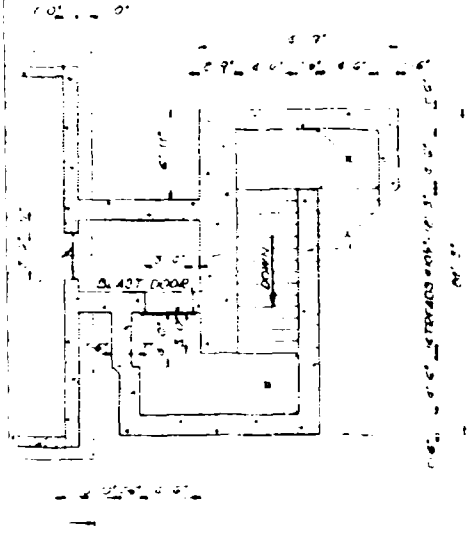




DESIGN CONDITIONS

Design Procedure

Design Blast Wave

Blast Loading on Exterior Surface

Nuclear Radiation Protection

Strength of Materials

	Static	Blast Design

Allowable Stresses and Deflections

General Notes

REVISION	DATE	DESCRIPTION	BY	APPROVAL

AMMANN & WHITNEY
CONSULTING ENGINEERS
111 8TH AVENUE, NEW YORK, N. Y.

DEPARTMENT OF THE ARMY
OFFICE OF THE CHIEF OF ENGINEERS
MILITARY CONSTRUCTION ENGINEERING DIVISION
WASHINGTON 25, D. C.

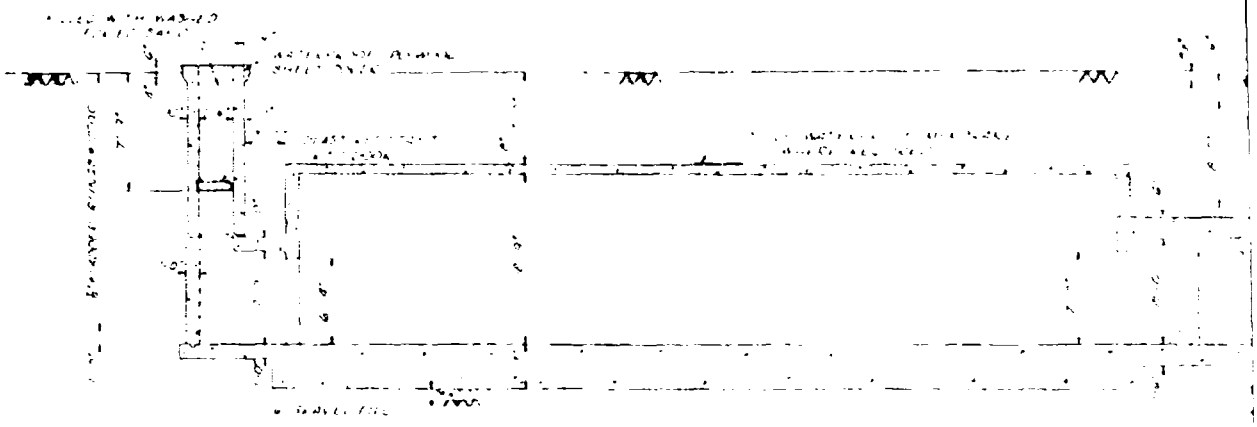
DESIGN BY FLW
DRAWN BY
CHECKED BY
APPROVED BY

PROTECTIVE CONSTRUCTION
GENERAL PURPOSE STRUCTURE
BURIED CONCRETE IGLOO
100 PSI BLAST RESISTANT

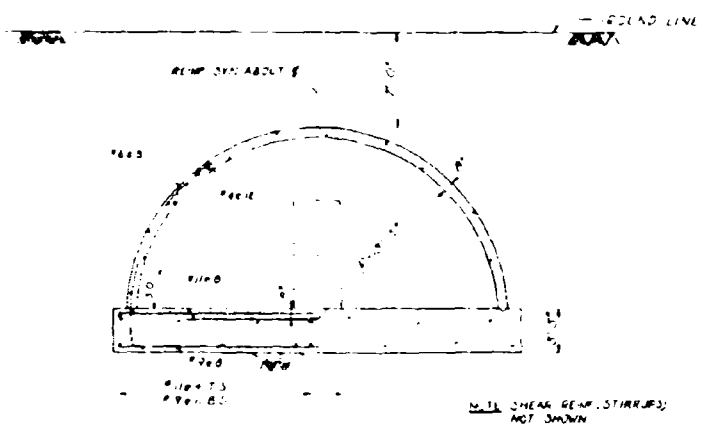
SCALE 3/16" = 1'-0"

DRAWING NUMBER
60-18-07
SHEET 1 OF 2

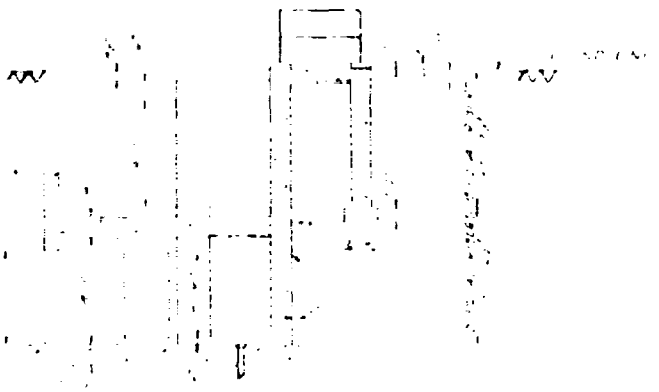
DATE



SECTION A-A



SECTION B-B



2

REVISION	DATE	DESCRIPTION	BY	APPROVED

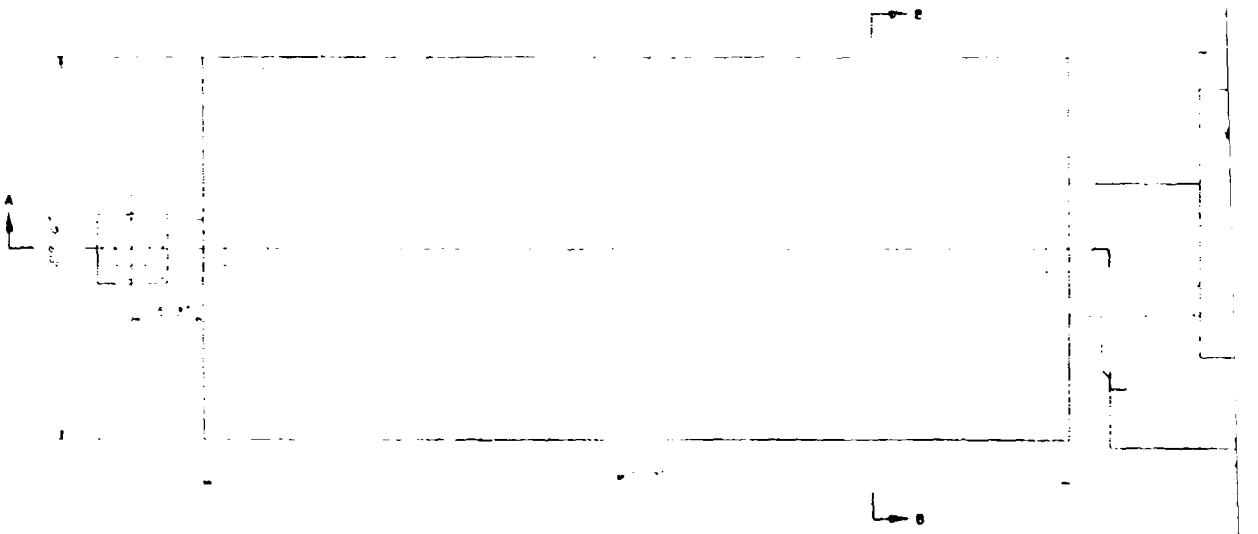
AMMANN & WHITNEY
CONSULTING ENGINEERS
111 FIFTH AVENUE, NEW YORK, N. Y.

DEPARTMENT OF THE ARMY
OFFICE OF THE CHIEF OF ENGINEERS
MILITARY CONSTRUCTION ENGINEERING DIVISION
WASHINGTON, D. C.

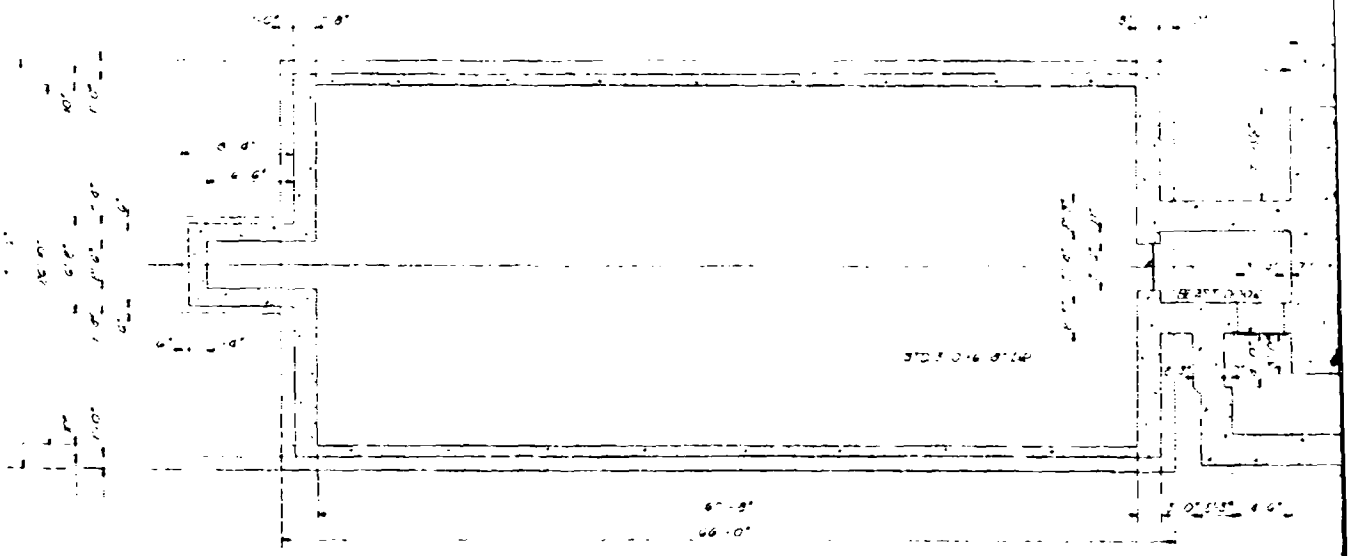
DRAWN: F.J.H.
TRACED BY:
CHECKED BY:
SUBMITTED:
CHIEF ENGINEER
DATE:
CHIEF, MILITARY DESIGN DIV.
APPROVED:
DATE: MAY 1955

PROTECTIVE CONSTRUCTION
GENERAL PURPOSE STRUCTURE
BURIED CONCRETE IGLOO
100 PSI BLAST RESISTANT

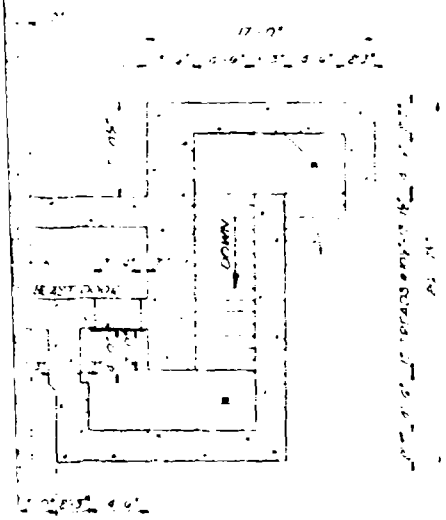
DRAWING:
DATE:
CHIEF, MILITARY CONSTRUCTION DIV.
SCALE: 1/8" = 1'-0"
SHEET NO.
DRAWING NUMBER
60-18-07
SHEET 2 OF 2



ROOF PLAN



FLOOR PLAN



DESIGN [illegible]

Design Pressure

[illegible]

Design Blast Wave

[illegible]

Blast Loads on Exterior Surface

[illegible]

Nuclear Radiation Protection

[illegible]

Strength of Materials

	Static	Blast Design
[illegible]	[illegible]	[illegible]
Concrete		
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]

Allowable Stresses and Deflections

[illegible]

General Notes

1. The following features are not shown and shall be determined to suit use requirements:
   - Interior partitions
   - Mechanical and electrical equipment
   - [illegible] and decontamination facilities
2. Access stairs may be added as required.
3. Access ramp may be provided if required for vehicles.
4. The [illegible] protection to be [illegible] in the form of doors.

REVISION	NTR	DESCRIPTION	BY	APPROVAL

AMMANN & WHITNEY
CONSULTING ENGINEERS
111 8TH AVENUE, NEW YORK, N. Y.

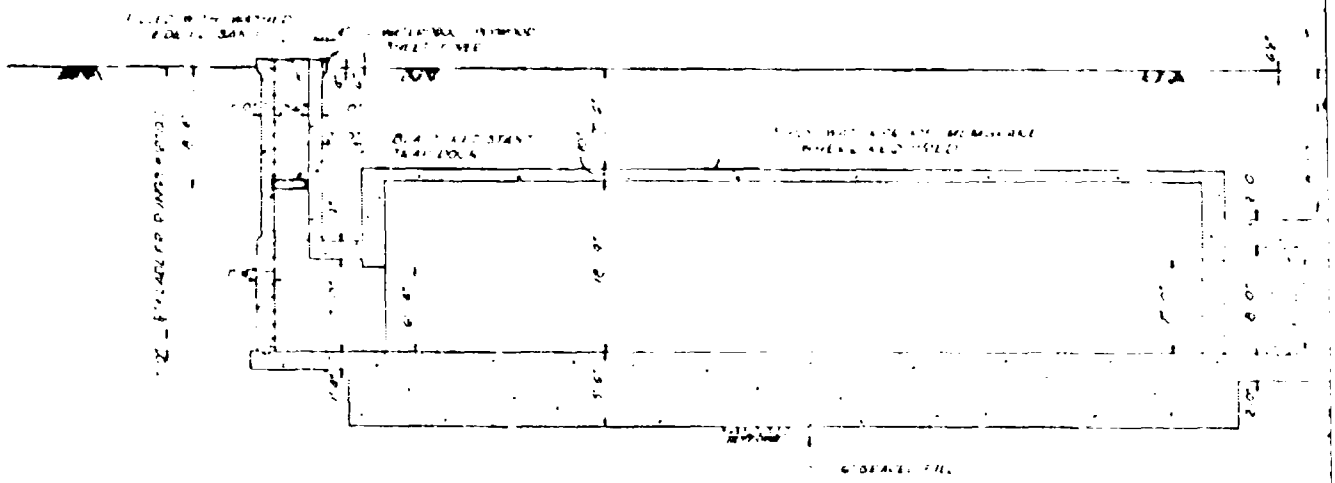
DEPARTMENT OF THE ARMY
OFFICE OF THE CHIEF OF ENGINEERS
MILITARY CONSTRUCTION ENGINEERING DIVISION
WASHINGTON, D. C.

DESIGNED BY FJM
DRAWN BY
CHECKED BY SRP
SUBMITTED
DIRECTOR
APPROVED
DATE

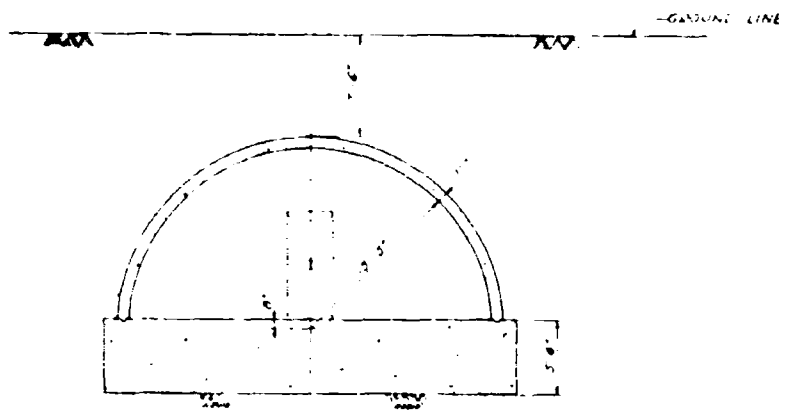
PROTECTIVE CONSTRUCTION
GENERAL PURPOSE STRUCTURE
BURIED CONCRETE IGLOO
200 PSI BLAST RESISTANT

DRAWINGS
DATE
SCALE 3/8" = 1'-0"
SPEC NO.
DRAWING NUMBER
60-18-07
SHEET 1 OF 2

2



SECTION A-A



SECTION B-B

AMMANN & WHITNEY

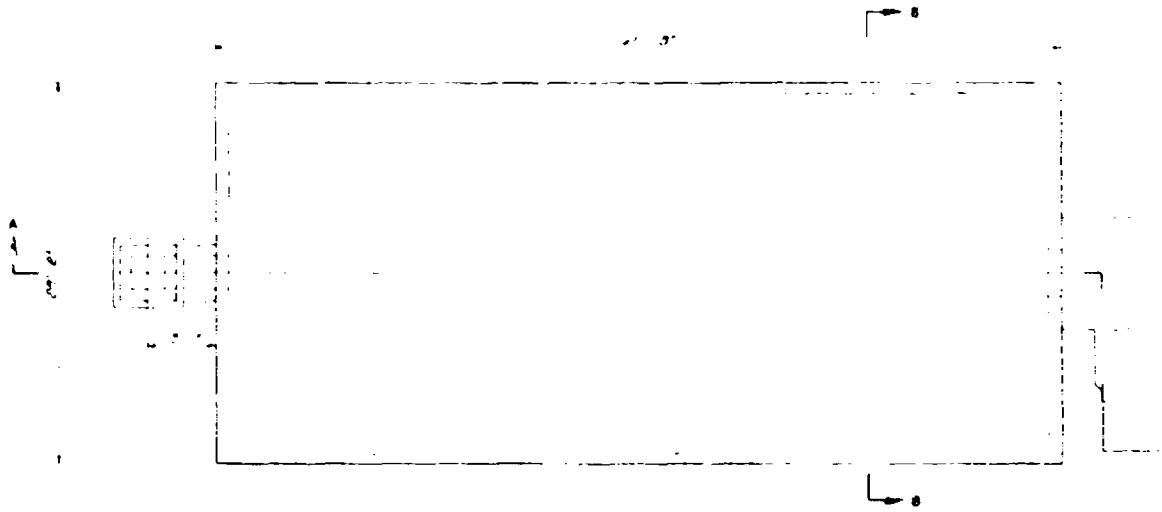
DEPARTMENT OF THE ARMY

PROTECTIVE CONSTRUCTION
GENERAL PURPOSE STRUCTURE
BURIED CONCRETE IGLOO
200 PSI BLAST RESISTANT

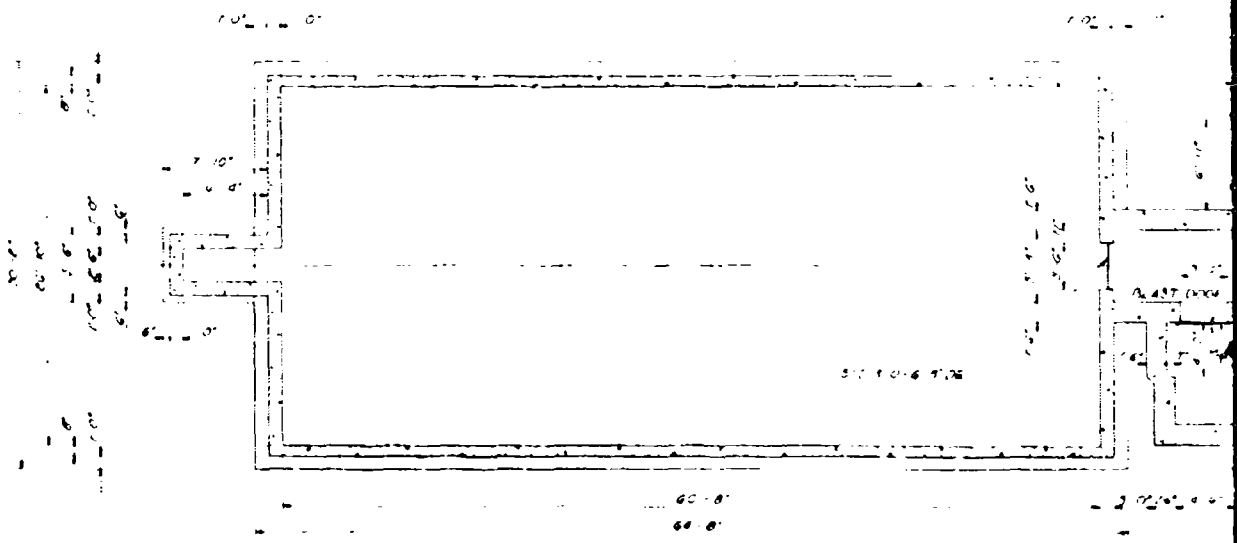
60-18-07

SHEET 2 OF 2

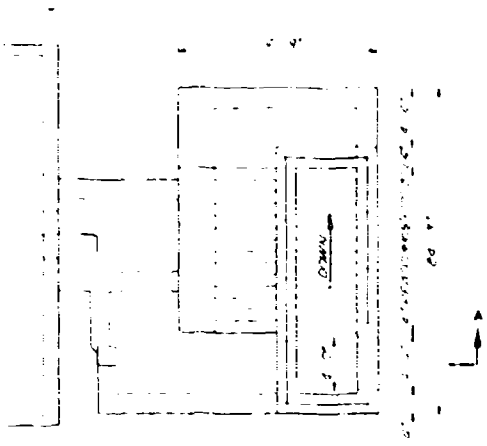
2

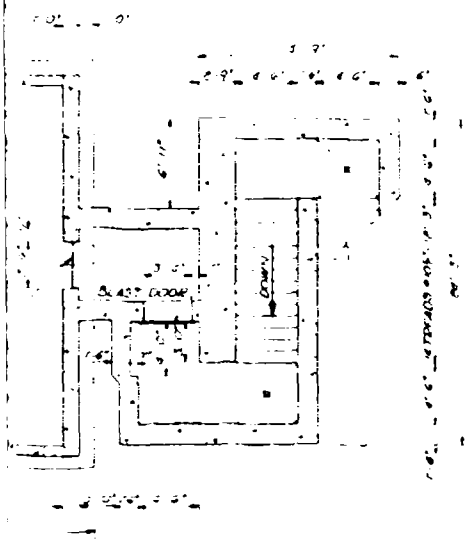


ROOF PLAN



FLOOR PLAN





DESIGN CONDITIONS

Design Procedure

Design Blast Wave

Blast Loading on Exterior Surface

Nuclear Radiation Protection

Strength of Materials

	Static	Blast Design

Allowable Stresses and Deflections

General Notes

REVISION	DATE	DESCRIPTION	BY	APPROVED

AMMANN & WHITNEY
CONSULTING ENGINEERS
111 8TH AVENUE, NEW YORK, N. Y.

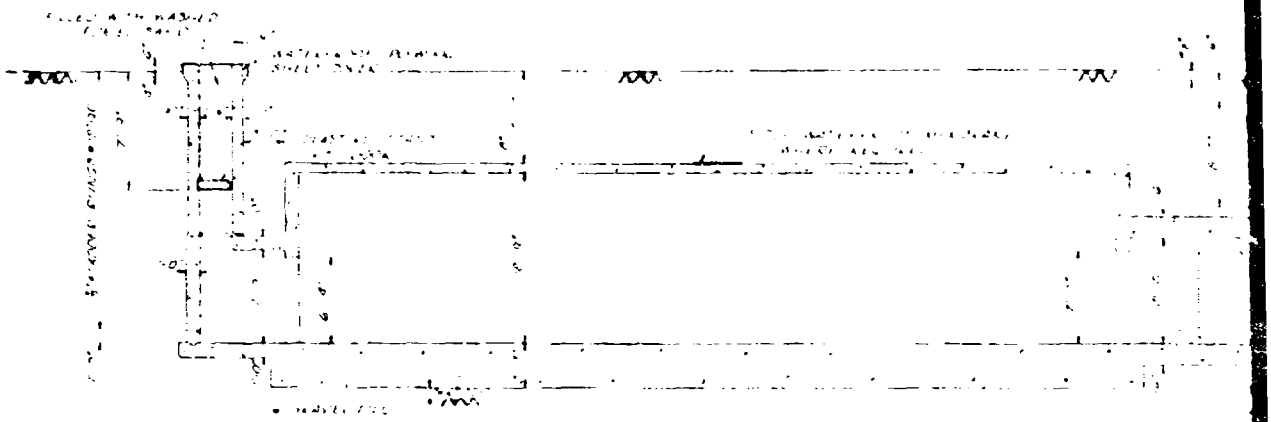
DEPARTMENT OF THE ARMY
OFFICE OF THE CHIEF OF ENGINEERS
MILITARY CONSTRUCTION ENGINEERING DIVISION
WASHINGTON, D. C.

DRAWN BY
TRACED BY
CHECKED BY
APPROVED BY
DATE

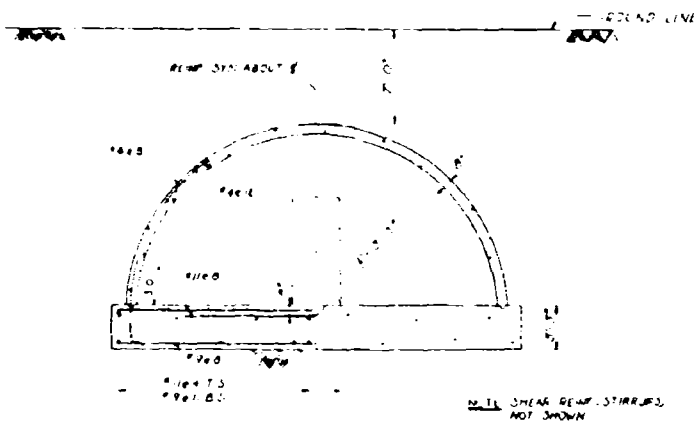
PROTECTIVE CONSTRUCTION
GENERAL PURPOSE STRUCTURE
BURIED CONCRETE IGLOO
100 PSI BLAST RESISTANT

SCALE 3/16" = 1'-0"

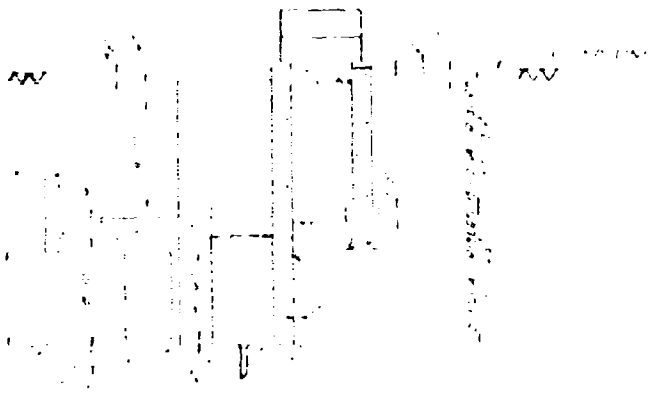
DRAWING NUMBER
60-18-07
SHEET 1 OF 2



SECTION A-A



SECTION B-B



AMMANN & WHITNEY
CONSULTING ENGINEERS
111 FIFTH AVENUE NEW YORK, N.Y.

DEPARTMENT OF THE ARMY
OFFICE OF THE CHIEF OF ENGINEERS
MILITARY CONSTRUCTION ENGINEERING DIVISION
WASHINGTON, D.C.

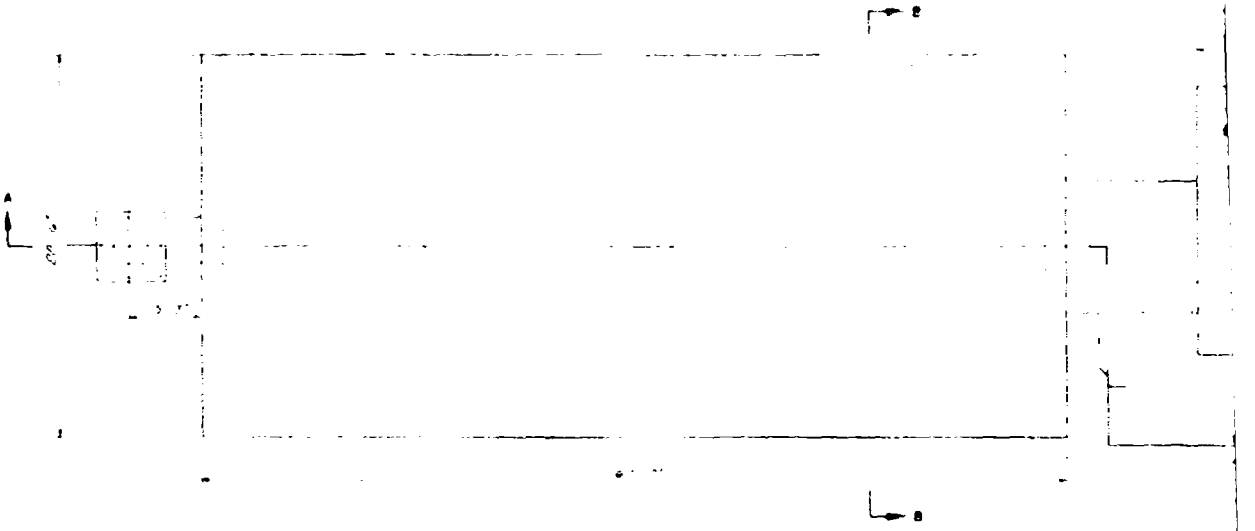
PROTECTIVE CONSTRUCTION
GENERAL PURPOSE STRUCTURE
BURIED CONCRETE IGLOO
100 PSI BLAST RESISTANT

SCALE 3/16" = 1'-0"

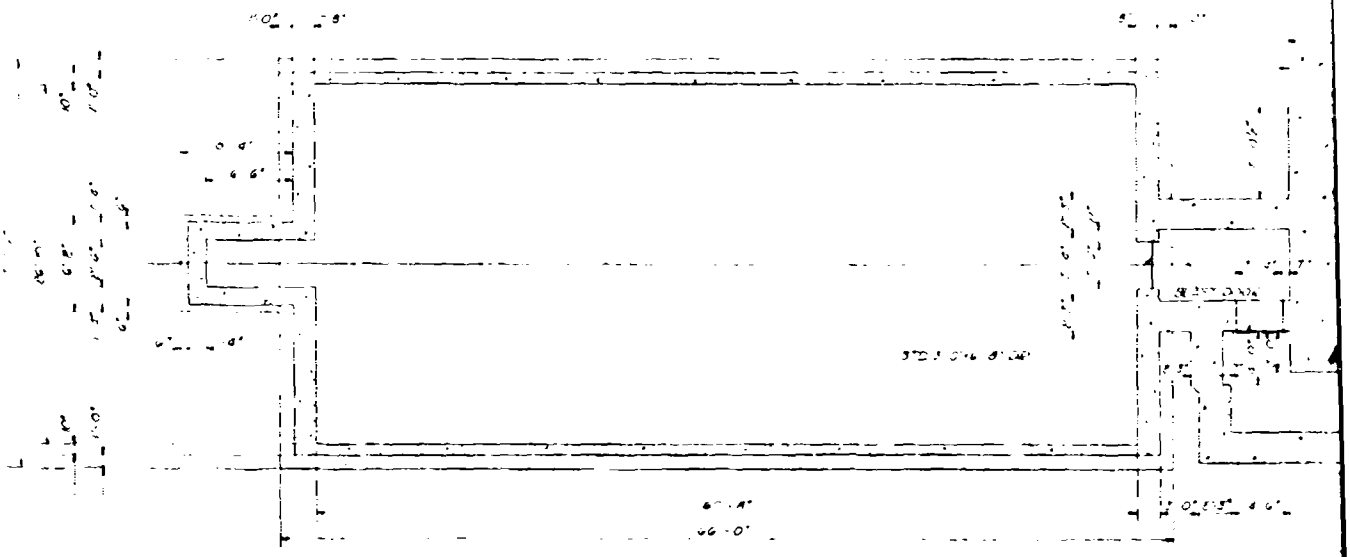
DRAWING NUMBER
60-18-07

SHEET 2 OF 2

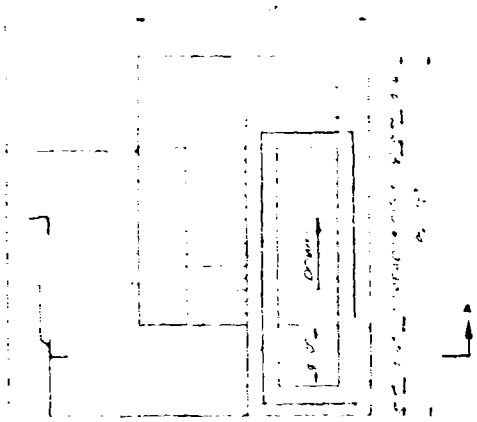
2

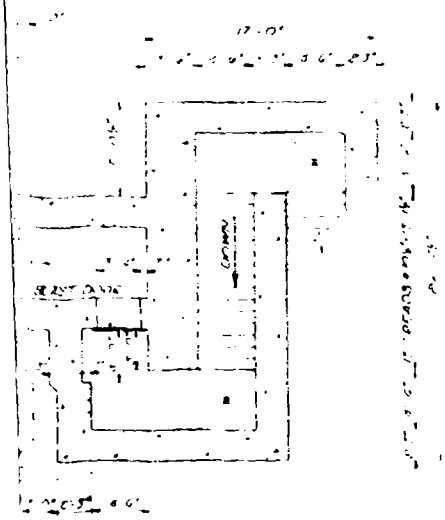


ROOF PLAN



FLOOR PLAN





DESIGN [illegible]

Design Procedure

[illegible]

Design Blast Load

[illegible]

Blast Loading on Exterior Surface

[illegible]

Nuclear Radiation Protection

[illegible]

Strength of Materials

	Static	Blast Design
[illegible]	[illegible]	[illegible]
Concrete		
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]

Allowable Stresses and Deflections

[illegible]

General Notes

1. The following [illegible] are not shown and shall be determined [illegible] requirements

   Interior partitions
   Mechanical and electrical equipment
   [illegible] and communication facilities

2. [illegible] may be [illegible] required
3. [illegible] may be [illegible] required for [illegible]
4. The [illegible] to be [illegible] [illegible] size of doors

REVISION	ATE	DESCRIPTION	BY	APPROVAL

AMMANN & WHITNEY
CONSULTING ENGINEERS
111 8TH AVENUE, NEW YORK, N. Y.

DEPARTMENT OF THE ARMY
OFFICE OF THE CHIEF OF ENGINEERS
MILITARY CONSTRUCTION ENGINEERING DIVISION
WASHINGTON, D. C.

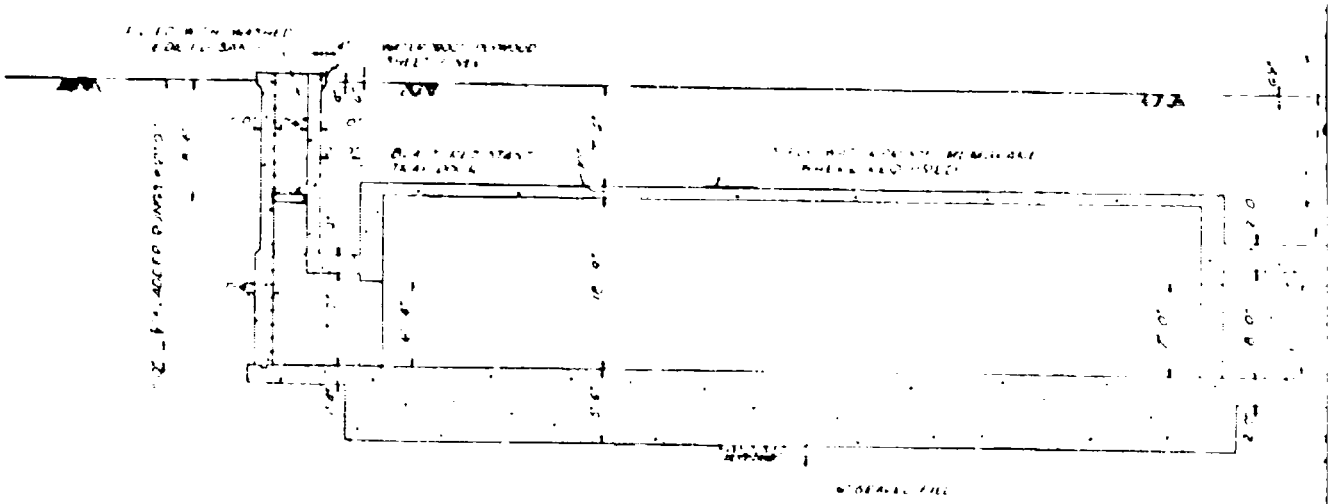
DESIGN BY: [illegible]
TRACED BY:
CHECKED BY: [illegible]
[illegible]
[illegible]

PROTECTIVE CONSTRUCTION
GENERAL PURPOSE STRUCTURE
BURIED CONCRETE IGLOO
200 PSI BLAST RESISTANT

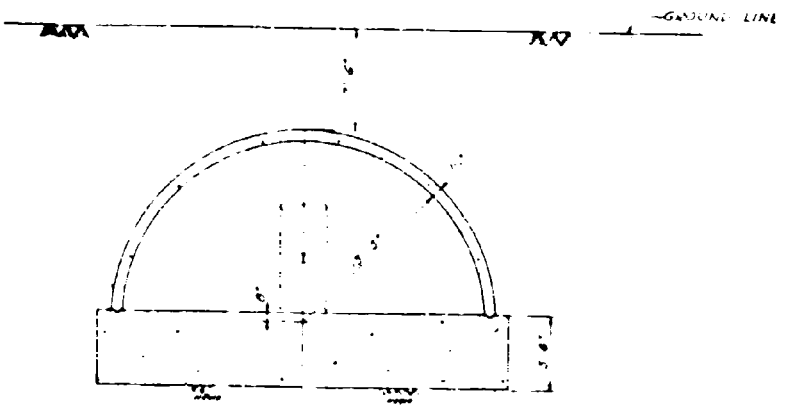
DRAWINGS: [illegible]
[illegible]
APPROVED:
DATE: [illegible]

SCALE: 1/8" = 1'-0"
DATE: [illegible]
DRAWING NUMBER
60-18-07
SHEET 1 OF 2

2



SECTION A-A



SECTION B-B

AMMANN & WHITNEY

DEPARTMENT OF THE ARMY

PROTECTIVE CONSTRUCTION
GENERAL PURPOSE STRUCTURE
BURIED CONCRETE IGLOO
200 PSI BLAST RESISTANT

60-10-07

2